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ABSTRACT

Papers delivered at the First American Reading Forum are collected in this yearbook. Focusing on the theme of comprehension, many of the essays respond to a preceding essay. The essays and reactions cover a variety of topics, including the following: (1) comprehension measures, (2) instructional strategies to promote comprehension, (3) current research and analysis of definitions of comprehension, (4) studies assessing secondary teachers' attitudes and perceptions of competency in content area reading instruction, (5) pupil reading pursuits in content area classrooms, (6) reducing test anxiety effects on reading comprehension of college students, (7) the comprehension of mathematical language, (8) the development of children's composition skills following targeted discussions of a distinctive literature selection, (9) adolescent literature as a vehicle for developing comprehension and composition skills, (10) reading instruction for prison illiterates, (11) sentence complexity, (12) strategies employed in miscomprehension, (13) textual constraints affecting adults' free recall, (14) teaching disabled students to read, (15) individualized reading programs, and (16) using advanced organizers in the classroom. (HTH)

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COMPREHENSION: PROCESS AND PRODUCT

FIRST YEARBOOK OF THE AMERICAN READING FORUM

1981

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Foreword

People throughout the ages have tried to understand the world about them. The search for the order and structure of things, and the relationship among them, can be shared in a communication. This group, the American Reading Forum, was formed so that a leisurely exchange of ideas might become a reality in our fast-moving world. The principle that guides the intellectual efforts of the Forum is one stated by Einstein: "The grand aim of all science is to cover the greatest number of empirical facts by logical deduction from the smallest number of hypotheses or axioms."

The theme, "Comprehension: Process and Product" was chosen to give direction to the conference participants and a unity to the *Yearbook*. This narrower theme approach is in contrast to the typical umbrella themes of reading and other educational conferences that have lead to a multitude of tomes that touch too lightly on a host of divergent topics.

The American Reading Forum then is to be viewed as a small group of teachers in search of knowledge of new ideas and a chance to integrate those ideas into past experience and to share those experiences one with another.

James A. Dinnan
Bob W. Jerrolds

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Invited Address
First General Session

TOWARD UNDERSTANDING COMPREHENSION

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Reading educators' traditional alternative for improving students' reading comprehension have been to (a) modify the text, (b) augment the text, or (c) modify the students' reading behavior. Each alternative has been the subject of considerable study and each one can be briefly characterized.

Most efforts to improve comprehension by modifying the text have been heavily influenced by the literature on readability. Consequently these efforts have relied on such practices as limiting the average number of words per sentence, substituting easy (i.e., short, frequently occurring) words for hard (i.e., long, technical) words, and modifying sentence structures, usually by making them more like age-peers' oral sentences or by shortening or otherwise simplifying base clauses. The results have not been particularly encouraging because readability—and comprehensibility—depend on a much more complex array of factors than sentence length, word frequency, and sentence structure.

Effective or not, making basic changes in the text can be both costly and unrealistic. Rewriting text is costly in terms of the time required. But even putting that consideration aside, one wonders whether rewriting text accomplishes much in helping students cope with real-life reading tasks. Perhaps a better way is to augment the text through the use of adjunct aids like advance organizers, objectives and questions. Adjunct aids can be characterized as orienting directions which dispose the reader to respond actively to certain aspects of the text. In general, the most commonly used adjunct aids—advance organizers, objectives and questions—can be quite effective in helping readers improve their comprehension scores. To oversimplify, then, studies show more positive results from augmented than for modified text. Perhaps this is partly because the adjunct aids do indeed involve the reader as an active participant, whereas modified text does little to change the readers' role. At the same time, there is evidence that the improvement in comprehension scores is caused by items related to the focus of the adjunct aids, not increased global "understanding" of the text. Also on the negative side, the provision of adjunct aids is teacher-directed, so students may never internalize the orienting activities sufficiently to become self-directing. Providing adjunct aids can be like providing crutches without effecting cures.

Attempts to improve comprehension by modifying students' reading behaviors do shift the emphasis from teacher-directed to student-directed activities. The more frequently encouraged activities include imaging, paraphrasing, and traditional study skills like underlining, summarizing, note-taking and outlining. Studies have demonstrated positive effects for each of these activities; but, in general, the positive effects have been found with older (i.e., high school and college) students who have above-average ability. On the positive side, such activities do indeed involve students in their own learning and offer the potential of being internalized. On the negative—or perhaps more properly, the realistic—side, the activities typically provide very little by way of developing readers' ability to deal with the structure of text. Because many of the activities require the reader to perceive the organizational structure of the text in order to proceed effectively, poor readers--the ones who need help the most—are helped the least.

Reading educators' traditional alternatives share a common flaw: their focus is too limited. Emphasis is placed either on the text, on the teacher (i.e., teacher-directed activities), or on the reader (i.e., reader-imposed behaviors or strategies); and there is little inclination to pay attention to the interactions among all three. Yet the clear message of the literature, the expressed concerns of teachers, and our own observations and common sense is that attempts to improve readers' comprehension of text must have concurrent regard for the text, the teacher—for the entire instructional milieu—and the reader. To have optimal effect, then, an effective instructional technique ought to give concurrent consideration to the background, abilities and short- and long-term needs of the reader; the expectations of the teacher; the resources of the instructional milieu; and the characteristics (i.e., facts, concepts, structure, organization) of the text. In other words, to have optimal effect the teaching technique would bring together the diverse aspects of a complex teaching-learning process. And, lest we forget, the technique would also embody the most promising implications of a vast and expanding body of related research.

This may be the place to confess that the title of this paper—"Toward Understanding Comprehension"—does not describe its focus. What I've been talking about, and what I'll continue to talk about, is not the thrust of or the need for research on the nature of comprehension. (The research on comprehension may already say more about comprehension than any person sincerely interested in reading education can understand.) What I really mean to be talking about is how we, as reading educators can discover ways to help learners not only to improve their comprehension of printed material but also, and more important, to improve their ability to comprehend. A more proper title, then, might be something like "Understanding Toward Comprehension."

My problem with the title may be related to a dilemma I see us facing in reading education. Should the main role of a reading educator be to conduct *or* to interpret *research? And, if the latter, then what does adequate interpretation amount to? But more about that later.*

There is indeed an extensive and rapidly expanding body of research that appears relevant to reading educator's efforts to enhance readers' ability to understand reading material. Just as an example I can point out three categories of studies that appear to promise much to reading education. All of the studies cited were conducted and reported by people who, I am confident, would not claim to be "reading educators" in the conventional sense. (In fact, I suspect that most, or all, of them might take offense at being called reading educators, noblesse oblige notwithstanding.) The categories can be characterized as follows:

(1). The Reader—where the focus is on the prior knowledge and knowledge structures of *readers*. Some investigators have been paying particular attention to readers' cognitive development (for example, Smirnov, 1973; Brown, 1975, 1977, 1979; Chi, 1978; Naus & Halasz, 1979) and to readers' use of prior knowledge, or schemata (for example, Norman, Genter, & Stevens, 1977; Anderson, Reynolds, Schallert, & Goetz, 1977; Rummelhart & Ortony, 1977; Kintsch, 1979; Rummelhart, in press) in order to better understand the personal characteristics that are involved in effective comprehension.

(2). The Text—where the focus is on the attributes of *printed material*. A number of investigators have been working with the analysis of text (for example, Kintsch, 1974; Meyer, 1975, 1979) and the adaptation of text (for example, Frase, 1972, 1975; Rothkopf, 1976; Rickards & Hatcher, 1978) in order to better understand the characteristics of text and textual modification as parameters of comprehension.

(3). The Interaction of Reader with Text—where the focus is on the point of interaction between *reader* and *printed material*. Investigators have been examining readers' metacognitive

> development (for example, Brown 1977, in press; Flavell, in press; Markman, in press; Baker, 1979), the development of study skills and learning strategies (for example, Anderson, 1978, in press; Brown, in press; Andre & Anderson, 1978), and the effects of schooling (for example, Olson, 1977a, 1977b; Cole, 1977; Meacham, 1977; Scribner, 1979) as they come to grips with the inescapable fact that reading comprehension is a product of both reader and text.

Taken together, these and related studies offer a rich—but largely untapped, in any systematic, integrative sense—reservoir of facts, implications, and direction for developing instructional procedures designed to enhance learning from text. I should like to suggest that it is up to reading educators to provide the systematization and integration that precedes application in the classroom and in the real world. If reading educators do not do it, nobody will.

Now please do not misunderstand. I know the challenge is an old one. For at least a millenium we educators have been lamenting the gap between "research" and "application." But generally the lamenting has been about as sincere as the wailing of paid mourners. The realities of the tenture system and the folkways of the craft effectively force a choice of *research* or *practice. There is virtually no incentive and consequently, very little inclination to make an earnest commitment to translating research results into instructional practice. Those who choose not to make a clear choice are likely to develop a schizoid style: one set of behaviors in the company of researchers and another, essentially unrelated set of behaviors in the company of practitioners. But the stark fact is that it is very difficult to live with one foot in each camp and virtually impossible to exist in the no-man's land between them.*

This is the time for another confession: I'm not sure I see a way out of the dilemma. In the manner of academicians, I find it easier to acknowledge problems than to come up with solutions. But in the manner of schizophrenics, I'm willing to share an experience. Just let it be clear that I'm sharing an experience; I'm not offering a solution—and I'm certainly not giving advice.

In our attempt to act as facilitators, my associates and I settled on the notion of developing an instructional technique that we hope will help to improve comprehension—not just what we know about comprehending. We described our purpose in an article for *Reading Psychology* (Otto, White & Camperell, 1980): ". . . on the basis of our observations in the field, our fantasies of how things could be, and our present perceptions of the related research, we have begun to develop procedures for *glossing* expository text. To oversimplify, we are using marginal and other intratext notations—gloss—to direct readers' attention while they read. Instead of relying on traditional adjunct aids like questions or advance organizers, we are attempting to direct readers' active attention to places in text where the application of specific skills would be appropriate (this could be for the purpose either of teaching or of encouraging the application of specific skills), to instances where a particular strategy could be useful for extracting meaning, and to key words and ideas. In other words, we are attempting to share mature readers' perceptions of and insights into the reading process with developing readers. We expect to make use of a wide range of techniques and activities, including traditional adjunct aids and study strategies. What we hope to do is to systematize our glossing procedures so they can be used with confidence, both formally, in the preparation of instructional materials, and informally, in face-to-face teaching in the classroom."

Recently, in the course of our work, we had occasion to prepare a position statement. While it won't tell you much about the specifics of glossing, I hope it does tell you something about where we're coming from and where we're headed. This is it:

> As we view the present scene, there is, on the one hand, a clearly recognized need for techniques that teachers can use to help students understand content-area texts; and, on the other hand, an extensive and rapidly expanding body of research and theory that promises to yield facts, implications and directions for developing the needed instructional techniques. The work we are proposing—development of a glossing technique—places us squarely in the middle, for we expect to seek implications for application in the existing research and theory as we develop the technique. We think that the middle is a viable position for teacher educators, for it provides opportunities to build much needed bridges.
>
> We are, then, committed to the middle position, where we attempt to expedite the translation of research and theory to classroom application. This commitment is the basis for four decisions which, in turn, shape the planning of our work.
>
> First, our approach to developing the glossing technique is *eclectic*. (We would even go so far as to say it is, at least at this early stage, deliberately *atheoretical*). In other words we are not attempting to develop the glossing technique in line with a particular theoretical position—or to extend any particular line of research. To the contrary, this eclectic stance leads us to seek implications from an array of relevant, or seemingly relevant work. For the moment we are confining our search to promising areas of cognitive psychology—schema theory, memory development, text analysis, adjunct aids, metacognition, study strategies and text processing. We readily acknowledge the relevance and promise of other areas—sociolinguistics is a prime example. But even as we restrain ourselves from wild grabbing, we do not claim expertise, as teacher educators, in such an array of subareas of cognitive psychology. Hence, last month we hosted a conference on *Reading Expository Text*. The conference was one attempt to extend our personal perceptions in a systematic way by seeking the insights of qualified others. We expect to continue to seek the advice and criticism of specialized scholars.
>
> Second, the glossing technique is deliberately "global" in nature. That is, the technique subsumes a variety of activities that address such diverse things as (a) development and/or application of specific skills and strategies, (b) the amplification or clarification of content, and (c) the internalization of skills and strategies. Of course "global gloss" is messy, both when it comes to specifying exactly what gloss is or how to gloss a text and when it comes to designing studies that show exactly which activities do or do not enhance which readers' ability to understand expository text. But if gloss is to embody the integrative feature we are seeking, it must necessarily address, simultaneously, (a) the techniques and strategies involved in the reading process, (b) characteristics of a given text, and (c) the facts and concepts of a given content. Once we can reliably put together gloss that "works" (i.e., enhances understanding of text) with identifiable individuals or groups, then we can devise studies to find out why it works.
>
> In other words, we think that for now it is important to *synthesize*, to take what common sense and informed analysis hold to be promising and intuitively devise a technique that is credible and useful to both teachers and students. Once we have that we will *analyze* to find out what works best and with whom.
>
> Third, we expect to develop two sets of guidelines for glossing expository materials: *guidelines for informal glossing*, which teachers can use on a day-to-day basis with the textbooks in their content-area classrooms, and *guidelines for formal glossing*, which we can use to develop prototype materials for demonstration, instruction and study. We expect the two sets to be similar in intent and substance; but, at the same time, they will differ in detail and application.
>
> Ultimately, teachers need guidelines that they can use informally to help students understand content-area texts. Consequently, we want to describe the glossing technique (or, probably more properly, *techniques* for glossing, for we expect that certain specific techniques will be more effective with certain individuals and groups) in terms that teachers can use informally to gloss content-area texts. Of course such guidelines will not, and should not, give the definitive direction of, say, a set of specifications for creating a computer program. They should, however, be a melding of such things as (a) facts about the skill and strategy aspects of gloss that work best and with whom (e.g., that activities which focus on application of specific skills are most helpful to poor comprehenders; that activities which focus on inference-points in a text are most useful to readers who have a good background of related content knowledge), (b) practical procedures for analyzing and dealing with characteristics of text (e.g., organization; concept-load), (c) consideration for students' background knowledge related to a given text, and (d) sensitivity to the need for helping

> students move toward internalization of the skills and strategies that are demonstrated and developed through glossing. In other words, we look toward a set of guidelines for teachers that is rooted in facts and tempered by feelings that come from an awareness of situational constraints and considerations.
>
> Concurrent with the development of guidelines for teachers, we expect to develop prototype gloss for demonstration and study. This means that we must develop more formal guidelines for glossing materials. Such guidelines should also be useful to publishers, both in preparing adjunct materials for content-area text and in preparing instructional materials designed to improve students' general skills and strategies for understanding expository texts. The goal we set for "formal gloss," insofar as its instructional applications are concerned, is to help readers move from a stage where they rely on gloss to assist their understanding to a stage where the skills, strategies and insights they have acquired are internalized and self-sustaining. In other words, *formal gloss* should go beyond "providing crutches"—which is the case with most adjunct aids, and text modifications—to "effecting cures" (i.e., not merely improving comprehension, but improving readers' ability to comprehend).

That is what we said. We put ourselves in that vast and formidable no-man's land between research and practice. And, in effect, (you can judge whether in folly), we said that we would attempt to act as mediators, giving attention to some finite yet significant set of implications from the research side and to some clearly perceived and significant set of concerns on the practice side. A cynic might say that we put ourselves in an extremely vulnerable position, inviting potshots from both sides! On the other hand, one might say that we put ourselves in exactly the right position, as teacher educators, to perform a most vital and useful function.

To this point I've claimed to be behaving in the manner of academicians and of schizophrenics. You may judge the redundancy of those claims. But now let me *disclaim* acting in the manner of a first-general-session speaker, for I will offer neither conclusions nor summary. I choose to believe that we're here for the first of many meetings of the American Reading Forum because we want to engage in open-minded—and, at least some of the time, open-ended—discussion of issues related to reading education. I've tried to share with you some of the issues as I see them. I'm looking forward to the discussion.

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ASSESSMENT OF COMPREHENSION BY STANDARDIZED, NORM-REFERENCED TESTS

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Standardized, norm-referenced tests are prominent parts of most evaluation programs used to assess progress in reading. Though results are used along with other data about student progress, scores on standardized, norm-referenced tests are highlighted in discussions about reading progress. Some federal programs in the past have mandated that these tests be a major part of program evaluation. Reports of reading progress—or lack of progress—of states and school systems published in newspapers and periodicals usually are based upon results of these tests. Farr, Tuinman, and Rowls (1974) and Harnischfeger and Wiley (1976) concluded that reading achievement has either decreased gradually or leveled off. More recently, Farr, Fay, and Negley (1978) reported that students in one state were reading better in 1976 than students of comparable grades 30 years earlier when adjustments were made for age differences. Cooperman (1978), on the other hand, criticized the effectiveness of reading instruction. All of these—and many other studies—utilized data gathered from use of standardized, norm-referenced tests.

An implication that can be drawn from a closer look at data on reading achievement trends is that a more effective job likely is being done in teaching word recognition skills than in teaching comprehension (Aaron, 1978). A recent study by Durkin (1979) contends that very little teaching time is being devoted to reading comprehension. Although Durkin's findings may or may not be typical of teachers as a whole, comprehension is what reading is all about, and that is why the focus of this study is on comprehension.

Information about comprehension tests should be useful to evaluators, teachers, researchers, and administrators. Test users need to know what tests measure and how they measure it. Further, a comparison of tests will provide more insight into why results obtained from different publishers' tests differ. A study of test items will also help users compare skills assessed by tests with skills taught in basal materials used in their own schools or systems. This latter area of concern becomes more important in view of the current practice of using some standardized, norm-referenced tests as if they were criterion-referenced tests. Lastly, agreement on exactly what make up comprehension is hard to come by, but whatever it is, everybody believes in it.

Purposes of the Study

This study aimed toward learning more about how reading comprehension is assessed by five widely-used standardized, norm-referenced tests of reading comprehension. The five tests examined were the *California Achievement Test* (CAT), Levels 12-19 (1977); *Gates-MacGinitie Reading Tests* (G-M), Levels C-F (1978); *Iowa Test of Basic Skills* (ITBS), Levels 7-14 (1978); *Metropolitan Achievement Test* (MAT), Levels Primary II-Advanced II (1978); and the *Stanford Achievement Test* (Stan), Levels Primary II — Advanced (1973). Specific purposes were to analyze the passages and items on the comprehension subtests of the five selected tests in terms of the discourse form (narrative, expository, descriptive, and argumentation) of the passages on which the items were based, the comprehension level assessed (literal, inferential, and evaluative), the comprehension skills assessed, the estimated readability of each passage, and the length of the passages on which the items were based. In addition, the investigators made inter-test comparisons on each of the aforementioned points at the fourth and eighth grade levels.

The *Anchor Test Study* (1974) was carried out because it was recognized that widely used standardized, norm-referenced tests differed considerably in measuring units and in what they measured. This project established interchangeable norms among eight widely used tests so users could pretest with one test and posttest with another publisher's test. However, since 1974, all eight tests examined during the *Anchor Test Study* have been substantially revised.

In the present study, the focus is placed on the latest versions of the reading subtests that assess comprehension in five of the eight standardized, norm-referenced tests used in the *Anchor Test Study*. All of these tests also assess decoding skills and meaning vocabulary; however, no effort was made to examine any subtests other than those assessing comprehension. The researchers recognize the importance of the other subtests, but they were most interested in comprehension for reasons previously mentioned.

Procedures

Throughout the examination of the comprehension subtests of the five standardized, norm-referenced tests, the two researchers worked independently of each other in classifying each selection and/or item in terms of discourse form, comprehension level, comprehension skill being assessed and length of selection. Then meetings were held to compare findings and arbitrate differences where necessary.

Discourse Form

The selections were categorized initially into the two broad categories of poetry or prose. Then all selections were categorized into the four traditional forms of narration, exposition, description, and argumentation. The usual definition of discourse form were used as guides (Shaw, 1972; IRA, at press). Often, discourse is a mixture of several forms, but usually one form predominates. In this study the two researchers were able to agree on all passage classifications.

The five tests examined vary widely in amount of the four forms of discourse. Only three of the five tests use poetry and it accounts for a very small number of the passages and items. Four of the tests have few, if any, argumentation passages. Inter-test comparisons at a single level reveal considerable differences in amount of the forms of discourse. Generally, all of the tests, except the *California Achievement Test*, rely most heavily on narrative and expository passages for assessing reading comprehension. Refer to Table 1 for a complete summary of the percentages of discourse forms found within each test. Poetry, which is presented in a separate column, also is included in the *Description* column.

Levels of Comprehension

All items were classified in terms of level of comprehension: literal, inferential, or evaluative. An uncomplicated, straightforward classification scheme was employed. If an item could be answered from information directly stated in the passage, it was considered to be literal. It was deemed unnecessary that the answer be stated in the exact words of the stem and appropriate completion, but it had to be answered clearly in the discourse without requiring use of inference. Inferential items were those in which answers were not explicitly stated in the passage and where evaluation was not involved. In inference, the basis for the answer, all facts needed to determine the correct answer, might be presented in the passage, but to reach the answer the reader must fill in gaps from experience or according to logic. An evaluation item was one in which the reader's judgment was involved.

The classification scheme used in this analysis is different somewhat from existing taxonomies such as the widely followed taxonomy of Barrett (1976). For example, Barrett's taxonomy has a fourth category labeled "appreciation." Further, Barrett's taxonomy includes recall of main ideas and sequence under literaly recognition as well as under inferential. As Pearson and Johnson (1978) point out, main ideas are seldom literal; they must be implied. Similarly, sequence must be inferred unless events or actions are prefaced by words indicating order of occurrences, as "first," "next," or "last."

The five tests utilized in the study vary considerably in how they categorize items, though all tests use the categories of literal and inferential. The *California Achievement Test* uses literal comprehension, interpretative comprehension, and critical comprehension; the *Gates-MacGinitie* includes only literal and inferential items; the three categories of the *Iowa Tests of Basic Skills* are literal meaning (facts), interpretative meaning (inferences), and evaluative meaning (generalizations); the six-way breakdown of the *Metropolitan Achievement Test* includes vocabulary, literal-specific, literal-global, inferential-specific, inferential-global, and evaluation; and the *Stanford Achievement Test* divides items into global meaning, explicit meaning, implicit meaning, meaning determined by context, and inferential meaning. The categories used in this study most closely match those of the *ITBS*, but the subcategories differ somewhat. For example, main idea and figurative language are listed as evaluative meaning rather than as inferential in the *ITBS*.

Within the levels of a given test, the percentages of literal, inferential, and evaluative items vary widely and appear to follow no particular pattern. Inter-test comparisons reveal considerable differences in percentages of literal and implied items, and only one test gave any substantial attention to evaluation items. The most striking feature, in terms of the levels of comprehension assessed, is that at most levels inferential items far outnumber literal test items. See Table 1 for a breakdown, by test, of the number of items and percentage of items that were at the various levels of comprehension.

Classification of Skills

Currently available materials designed for use in reading instruction and evaluation are, for the most part, based on a skills approach to comprehension. Almost without exception, basal reader series and other published instructional materials, knowingly or unknowingly, are built around the idea that comprehension is made up of skills and abilities, rather than being global or unitary in nature. The same can be said about standardized reading tests and the approaches presented in reading methodology texts.

Classifying test items in terms of the comprehension skill assessed may appear to be a simple task. However, the task is far from simple on some types of items. An item may involve more than one skill, as drawing a conclusion and cause and effect relationship or vocabulary and figurative language. Further, all items could be classified as identifying main ideas or details. Therefore, some hierarchical pattern must be established when undertaking a categorization task of this nature.

In the present study, the researchers, working separately, classified each item on all levels of all subtests into one of nine categories (see Table 2 for the nine categories utilized). Then results were compared and any differences were arbitrated. Occasionally, items were found which tapped more than a single skill, as character's feeling and drawing a conclusion. Such items were classified under the skill that appeared to be the focus of the item. If an item assessed a skill like character's feeling or cause-effect relationship which could be answered only by drawing a conclusion, then the item was categorized under the skill other than drawing a conclusion. Any item classified as detail was an item involving something other than a main idea and one that did not fit any other skill category.

With regard to the comprehension skill assessed, only a few comprehension subskills are sampled within a given level of a test. In fact, many reading comprehension subskills taught in basal readers are not assessed in any of the five tests. A comparison of the five tests reveals an emphasis by three of the tests on detail, main idea, and cause-effect items. Four of the five tests have the vast majority of their items falling into these three subskill categories plus drawing conclusions. Only one test reveals a spread across the nine comprehension subskill categories. See Table 2 for the percentages of subskills assessed by items on the five tests.

Readability of Passages

Besides investigating discourse form and the levels and skills of comprehension assessed by the five standardized, norm-referenced tests, the researchers investigated the difficulty of the passages upon which the test items were based. Specifically, passage length, sentence length, item density, and readability estimates were studied.

Three readability formulas were utilized to obtain estimates of passage difficulty. The Harris-Jacobsen Readability Formula (1975) was used for test levels designed for third grade or below. This formula was utilized at the primary levels of the five tests because it provides specific grade levels and subdivisions of each grade level through the third grade (i.e., preprimer, primer, first reader). The Fry Readability Graph (1968) was used for test levels at or above the fourth grade. The Dale-Chall Readability Formula (1948) was utilized to spot-check results of the Fry Graph when grade levels obtained were three or more grade levels above or below the test audience. In the case of the Fry Readability Graph, as many 100 word samples as possible were used to obtain an overall passage readability level. For example, a 526 word passage's readability level was based on five 100 word samples.

Readability estimates reveal that readability levels of selections within a test vary widely and follow no particular arrangement in terms of a progression of difficulty. In addition, readability estimates vary among the five tests at comparable difficulty levels. Table 3, which reveals the median readability estimates for each level of each test, indicates that for the most part each test level's median readability estimate is at the approximate difficulty level for the intended test audience. However, the range of readability estimates, also provided in Table 3, for each test level discloses a wide disparity in terms of the difficulty of the passages within a given test level. Specifically, the middle levels of the five tests show the widest range of readability estimates, varying from a three grade level range to a twelve grade level range. Refer to Table 3 for a complete summary of the median readability estimates and range of readability estimates for each level of each test.

With regard to passage length, sentence length, and item density, selections vary considerably in length, and selections within a test are not arranged from shortest to longest. Some of the tests have much longer selections than some other tests at comparable difficulty levels. Also, the number of selections at a given level vary considerably among the five tests. Item density results also show wide differences among the tests. Table 4 summarizes the findings concerning passage length, sentence length, and item density.

In order to make inter-test comparisons easier for the reader, a comparison of each area investigated was made at the fourth and eighth grades. The results of this comparison are provided in Tables 5, 6, 7, and 8.

Implications

A number of implications may be drawn from the findings of this study. Among those that can be drawn are:

1. Users of standardized, norm-referenced tests should remember that test content varies widely from level to level and from publisher to publisher. Therefore, results on any two given levels of the same test or on two different tests should not be expected to be the same for a student.
2. Almost all levels of the tests contain a higher percentage of inference items than literal. These tests are of limited use in assessing literal and evaluative comprehension.
3. Standardized, norm-referenced tests assess comprehension around brief selections and ask too many questions so that some must be about trivia. The tasks in comprehending important ideas in longer passages (as in short stories or in chapters in textbooks) may be quite different. Performance on one may not be similar to that on another.
4. The lack of a substantial number of evaluative items in these tests leads one to the conclusion that the tests tell little about a student's ability to read critically. In addition, some of the tests give limited attention to assessing literal comprehension. Therefore, some of the tests tell very little about how well students can comprehend literally.
5. Many comprehension skills are not assessed in these tests. Therefore, their usefulness in pinpointing strengths and weaknesses in skill areas is very limited. For instance, the *Metropolitan Achievement Test* is limited as a "criterion-referenced" test.
6. Most of the tests show "ragged profiles" in terms of sequential "buildup" in passage difficulty. Publishers may need to give closer attention to this aspect of test development.
7. Instructional decision-making and program evaluation should include other sources of information besides standardized, norm-referenced tests for the sake of accuracy.

The results of this study point out the need for teachers, evaluators, researchers, and administrators to study closely the make up of standardized, norm-referenced tests as well as how they measure what they claim to measure. In the past there have been mismatches between instructional goals and outcomes and the instruments used to evaluate those goals and outcomes. Selecting the correct instrument for program evaluation will provide results which will be more relative to what has been taught.

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Table 1

ANALYSIS OF DISCOURSE FORM AND COMPREHENSION LEVEL ON FIVE WIDELY-USED STANDARDIZED, NORM-REFERENCED TESTS, PRESENTED IN PERCENTAGES

			Discourse Form					Comp. Level		
Test	**Level**	**No. Items**	**Narr.**	**Expo.**	**Desc.**	**Arg.**	**Poet**	**Lit**	**Inf.**	**Eval.**
CAT	12	20	67	33	0	0	0	40	60	0
	13	27	67	0	33	0	0	22	78	0
	14	38	20	40	20	20	20	30	65	5
	15	40	17	33	33	17	40	25	68	7
	16	30	13	25	25	37	13	20	70	10
	17	40	13	25	25	37	13	20	68	12
	18	40	0	29	29	42	14	17	68	15
	19	40	0	29	29	42	14	7	78	15
G-M	C	44	55	45	0	0	0	32	68	0
	D	43	31	69	0	0	0	19	81	0
	E	43	29	64	0	7	0	14	84	2
	F	43	14	72	14	0	0	33	67	0
ITBS	7	23	100	0	0	0	0	43	57	0
	8	37	25	75	0	0	0	37	59	4
	9	44	38	62	0	0	0	23	77	0
	10	49	38	50	12	0	0	14	86	0
	11	54	50	38	12	0	0	2	98	0
	12	56	38	38	24	0	12	4	96	0
	13	57	33	50	17	0	17	5	93	2
	14	58	0	71	29	0	29	5	91	4
MAT	Pr. 2	55	64	27	9	0	0	60	40	0
	Ele.	60	64	36	0	0	0	43	57	0
	Int.	60	27	37	27	9	0	40	58	2
	Adv. 1	55	0	75	25	0	0	36	62	2
	Adv. 2	50	0	75	25	0	0	26	70	4
Stan	Pr. 2	48	—	—	0	0	0	0	100	0
	Pr. 3	70	36	55	9	0	9	29	71	0
	Int. 1	72	36	55	9	0	9	29	71	0
	Int 2	71	8	75	17	0	8	37	63	0
	Adv.	74	8	84	8	0	8	35	65	0

Table 2

SKILLS SAMPLED BY ITEMS ON FIVE WIDELY-USED STANDARDIZED, NORM-REFERENCED TESTS, PRESENTED IN PERCENTAGES

Test	Level	Grade Level	Skills MI	D	V	C-E	DC	Ch	Seq	FL	Other*
California	12	1.6- 2.9	15	35	0	30	0	15	5	0	0
	13	2.6- 3.9	7	15	26	22	7	7	4	11	0
	14	3.6- 4.9	8	23	0	23	12	12	0	17	5
	15	4.6- 5.9	10	20	0	18	7	15	3	20	7
	16	5.6- 6.9	5	12	0	20	22	10	3	15	13
	17	6.6- 7.9	5	22	0	13	15	13	5	13	14
	18	7.6- 9.9	5	12	2	23	15	8	2	18	15
	19	9.6-12.9	10	5	2	18	18	8	2	22	15
Gates-MacGinitie	C	3	7	55	9	9	11	5	2	2	0
	D	4- 6	16	63	0	7	12	0	2	0	0
	E	7- 9	12	47	12	9	9	7	0	2	2
	F	10-12	16	39	5	5	25	5	0	5	0
ITBS	7	1.7- 2.6	0	57	0	22	8	13	0	0	0
	8	2.7- 3.5	0	52	0	26	7	15	0	0	0
	9	3	9	23	7	36	21	2	2	0	0
	10	4	8	21	4	35	22	6	2	2	0
	11	5	13	17	2	26	31	7	2	2	0
	12	6	14	20	5	16	32	5	2	2	4
	13	7	17	21	7	11	33	2	0	4	5
	14	8	17	21	5	12	29	0	0	9	7
Metropolitan	Prim. 2	2.5- 3.4	7	55	7	15	9	5	2	0	0
	Elem.	3.5- 4.9	5	47	8	22	2	3	12	2	0
	Int.	5.0- 6.9	8	32	17	18	10	3	3	5	4
	Adv. 1	7.0- 9.9	9	36	15	20	11	5	0	4	0
	Adv. 2	10.0 +	8	28	12	12	20	4	0	10	6
Stanford	Prim. II	2.5- 3.4	0	0	88	0	12	0	0	0	0
	Prim. III	3.5- 4.4	6	33	50	4	6	1	0	0	0
	Int. I	4.5- 5.4	7	33	17	10	31	0	1	1	0
	Int. II	5.5- 6.9	14	39	6	12	20	3	0	6	0
	Adv.	7.0- 9.5	8	35	11	18	22	0	1	4	1

MI — Main Idea
D — Detail
V — Vocabulary
C-E — Cause-effect Relationship
DC — Drawing Conclusions
Ch — Character Trait/Action/Feeling

Seq — Sequence Relationship
FL — Figurative Language
*Other Includes: Literary Type
Writer's Purpose
Recognition Fact/Opinion
Propaganda Technique

Table 3

MEDIAN READABILITY LEVEL AND RANGE OF READABILITY OF FIVE WIDELY USED STANDARDIZED, NORM-REFERENCED TESTS

Test	Grade Level	Mdn.	Range
CAT	1.6- 2.9	1	P-2/1
	2.6- 3.9	2/1	1-3/1
	3.6- 4.9	3/1	2/2-3/1
	4.6- 5.9	5	3- 8
	5.6- 6.9	6	5-10
	6.6- 7.9	7	6- 8
	7.6- 9.9	9	7-13
	9.6-12.9	10	6-13
G-M	3	4	2/1-7
	4- 6	6	3-10
	7- 9	8	3-14
	10-12	10	6-13
ITBS	1.7- 2.6	1	1-2/2
	2.7- 3.5	3/1	2/2-3/2
	3	3/1	2/2-4
	4	4	3/1- 6
	5	4	3/2- 6
	6	5	3/2- 7
	7	7	5-11
	8	7	4-11
MAT	2.5- 3.4	2/2	PP-8
	3.5- 4.9	7	3-11
	5.0- 6.9	7	5-10
	7.0- 9.9	9	5-12
	10.0+	10	9-14
Stan	2.5- 3.4	5	
	3.5- 4.4	3/2	3/1- 5
	4.5- 5.4	8	7-11
	5.5- 6.9	9	6-12
	7.0- 9.5	10	7-12

*PP = preprimer
P = primer

Table 4

ANALYSIS OF PASSAGE LENGTH, SENTENCE LENGTH, AND ITEM DENSITY ON FIVE WIDELY-USED STANDARDIZED, NORM REFERENCED TESTS

			Total Number of		Avg. Sent.	Avg. per Psg.		Avg. per Item		Range
	Psg.	Words	Sent.	Items	Length	Words	Items	Words	Sent.	Items Per Psg.
CAT										
12	3	300	33	20	9.09	100	6.67	15	1.65	5- 7
13	3	425	44	17*	9.66	142	5.67	25	2.59	5- 7
14	5	899	87	35*	10.33	180	7.00	26	2.49	3-10
15	6	993	91	40	10.91	166	6.67	25	2.28	4- 9
16	8	1459	123	40	11.86	182	5.00	37	3.08	3- 7
17	8	1546	132	40	12.98	214	5.00	39	2.90	3- 7
18	7	1700	113	40	15.04	243	5.71	43	2.83	3- 7
19	7	1815	117	40	15.51	259	5.71	45	2.93	3- 7
G-M										
C	22	1052	85	44	12.38	48	2.00	24	1.93	2
D	16	1342	91	43	14.75	84	2.69	31	2.12	2- 4
E	14	1348	74	43	18.22	96	3.07	31	1.72	2- 5
F	14	1262	57	43	22.14	90	3.07	29	1.33	2- 5
ITBS										
7	5	257	37	23	6.95	51	4.60	11	1.61	4- 7
8	4	380	31	28	12.26	95	7.00	14	1.11	4-10
9	8	1194	110	44	10.85	149	5.50	27	2.50	4- 8
10	8	1596	153	48	10.43	200	6.00	33	3.19	4- 8
11	8	1998	180	53	11.10	250	6.75	38	3.40	4- 8
12	8	2009	178	55	11.29	251	7.00	37	3.24	4- 9
13	6	2074	144	56	14.40	346	9.50	37	2.57	8-15
14	6	1898	123	57	15.43	316	9.67	33	2.16	4-15
MAT										
Pr. 2	10	1007	86	50*	11.71	101	5.00	20	1.72	5
Elem.	11	1256	103	60	12.19	114	5.45	21	1.72	4- 7
Int.	11	1857	120	60	15.48	169	5.45	31	2.00	5- 6
Adv. 1	9	1901	105	55	18.10	211	6.11	35	1.91	6- 7
Adv. 2	5	1564	72	50	21.72	196	6.25	31	1.44	5- 7
Stan										
Pr. II	1	114	6	6*	19.00	114	6.00	19	1.00	6
Pr. III	6	528	36	35	14.67	88	5.83	16	1.06	5- 7
Int. I	11	1476	65	66	22.71	134	6.00	22	0.98	6- 7
Int. II	12	1849	92	71	20.15	154	5.92	26	1.30	5- 7
Adv.	13	2136	103	74	20.74	164	5.69	29	1.39	4- 7

*Additional items based on sentences rather than passages

Table 5

ANALYSIS OF DISCOURSE FORM AND COMPREHENSION LEVEL AT THE FOURTH AND EIGHTH GRADE, GIVEN IN PERCENTAGES

	Discourse Form					Comp. Level		
Fourth	**Narr.**	**Expo.**	**Desc.**	**Arg.**		**Lit.**	**Inf.**	**Eval.**
CAT	29	48	9	14	9	30	65	5
G-M	37	63	0	0	0	19	81	0
ITBS	39	45	16	0	0	14	86	0
MAT	63	37	0	0	0	43	57	0
Stan.	37	55	8	0	8	29	71	0
Eighth								
CAT	0	35	35	30	18	18	67	15
G-M	33	58	0	9	0	14	84	2
ITBS	0	78	22	0	22	5	91	4
MAT	0	76	24	0	0	36	62	2
Stan.	8	86	6	0	6	35	65	0

Table 6

COMPREHENSION SKILLS SAMPLED BY TEST ITEMS AT THE FOURTH AND EIGHTH GRADE, GIVEN IN PERCENTAGES

Fourth	**MI**	**D**	**V**	**CE**	**DC**	**Ch**	**Sq**	**FL**	**Other***
CAT	10	20	0	18	7	15	3	30	7
G-M	16	63	0	7	12	0	2	0	0
ITBS	8	21	4	35	22	6	2	2	0
MAT	5	47	8	22	2	3	12	2	0
Stan.	7	33	17	10	31	0	1	1	0
Eighth									
CAT	5	12	2	23	15	8	2	18	15
G-M	12	47	12	9	9	7	0	2	2
ITBS	17	21	5	12	29	0	0	9	7
MAT	9	36	15	20	11	5	0	4	0
Stan.	8	35	11	18	22	0	1	4	1

*Literary type, writer's purpose, fact/opinion, propaganda

Table 7

READABILITY ESTIMATES OF PASSAGES FOR FOURTH AND EIGHTH GRADES

	Fourth Grade					Eighth Grade				
Passage Number	CAT (15)	G-M (D)	ITBS (10)	MAT (Ele)	Stan. (P.3)	CAT (18)	G-M (E)	ITBS (14)	MAT (A1)	Stan. (Adv.)
1	5	7	4	3	3/1	6	3	7	5	10
2	*	3	3/1	4	3/2	11	10	*	10	9
3	3	5	3/2	7	5	9	8	11	10	7
4	8	5	4	4	5	13	9	7	7	9
5	7	6	3/2	6	3/2	*	6	9	12	12
6	*	6	3/2	7		13	6	4	7	12
7		7	4	9		7	**	*	9	11
8		7	6	11			14		9	9
9		5		8			8		15	9
10		7		7			8			*
11		6		9			8			12
12		6					9			10
13		4					7			11
14		10					7			
15		5								
16		7								

* — Poetry
** — Invalid score

Table 8

ANALYSIS OF PASSAGE LENGTH, SENTENCE LENGTH, AND ITEM DENSITY AT THE FOURTH AND EIGHTH GRADE

		Total Number of			Avg. Sent.	Avg. per Psg.		Avg. per Item		Range
	Psg.	Words	Sent.	Items	Length	Words	Items	Words	Sent.	Items Per Psg.
Fourth										
CAT	6	933	91	40	10.91	166	6.67	25	2.28	4- 9
G-M	16	1342	91	43	14.75	84	2.69	31	2.12	2- 4
ITBS	8	1596	153	48	10.43	200	6.00	33	3.19	4- 8
MAT	11	1256	103	60	12.19	114	5.45	21	1.72	4- 7
Stan.	6	528	36	35	14.67	88	5.83	16	1.06	5- 7
Eighth										
CAT	7	1815	117	40	15.51	259	5.71	45	2.93	3- 7
G-M	14	1348	74	43	18.22	96	3.07	31	1.72	2- 5
ITBS	6	1898	123	57	15.43	316	9.67	33	2.16	4-15
MAT	9	1901	105	55	18.10	211	6.11	35	1.91	6- 7
Stan.	13	2136	103	74	20.74	164	5.69	29	1.39	4- 7

REACTION: ASSESSMENT OF COMPREHENSION BY NORM-REFERENCED TESTS

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The research report presented by Dr. Ira Aaron and Mr. E. Sutton Flynt, "Comprehension Level Categories of Five Standardized Comprehension Tests," pointed to some interesting information which should have immediate effect upon test selection for use in educational settings. Since the use of test scores may be for prediction of student success in various reading programs, the diagnosis of difficulties in reading, program evaluation, assessment of student achievement, and research, it is well that educators realize the characteristics of some of the most widely used standardized tests. The limitations of standardized tests for each of these purposes have been discussed to a great extent in the past. However, this research report clearly revealed even more basic limitations to varying degrees among the five tests included in the study.

The fact that there needs to be some refinement of the testing effort was implied through this study in that there was little consistency between concepts being taught and concepts being tested. Much time spent teaching isolated comprehension skills was not rewarded by increased student scores because the specific skills were not included in many cases on the major standardized tests. Very few items measuring literal meanings or items giving the test-taker an opportunity to evaluate information were included. The readability of some of the tests was not appropriate to the students for whom the test was designed.

The implications of this research were indeed pertinent to current practices in school systems throughout the country. Test selection and use must be seen with a greater degree of scrutiny, lest untold thousands of dollars continue to be spent in purchasing instruments which are not providing useable information. This scrutiny must be most diligent on behalf of the students whose very lives are affected by one performance on one test at one given time. Teacher opinion and expectation, parental concern, and student self-concept are hanging in the balance of test data reported via a computer stick-on tab and placed on the student's permanent record.

On the opposite side of the testing coin, it would be interesting to find out to what extent the standardized test scores are actually used for adjusting the educational program of the student. Other than grouping for instruction, is there instructional adjustment based on the needs of students as shown by standardized test results?

Dr. Aaron and Dr. Flynt have backed with research some basic feelings educators have had concerning standardized tests, but were reluctant to state. Hopefully, with this evidence, something will be done to strengthen the testing programs as a basis for positively aiding students. Rather than openly endorsing any of the five tests, the researchers urged educators to look closely at the total test make-up, item analysis, and readability of the tests. A comparison of materials being taught and materials being tested was also called for.

VARIETIES OF COMPREHENSION MEASURES: A COMPARISON OF INTERCORRELATIONS AMONG SEVERAL READING TESTS

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The purpose of this paper is twofold: First, to discuss some measurement problems in reading comprehension, and second, to report some research results on a new reading test.

Of all the terms used, and variables presumably measured in the testing of reading performance, none is more difficult to define or specify than the construct, *reading comprehension*. A quick consideration of the other two most frequently measured variables, rate and vocabulary, shows real differences in the clarity of what we are measuring.

In the case of reading *rate*, we have a nice, neat, numerical concept to lean on. It is the number of words read per minute. That sounds very simple and straightforward, and if we ignore the problems of reliability and validity, it is. At least we know what is being measured, even if some of us are not convinced that it is the most important thing to measure.

When we talk about measuring *vocabulary*, we can say some very general, widely accepted things about it. Vocabulary tests are usually thought of as reasonably reliable, and probably valid if they have face validity or content validity for the particular student and curriculum. There are problems when we try to specify exactly what we mean by "knowing a word," but most of us do not reject the test because of these difficulties.

Comprehension, on the other hand, is a much fuzzier notion, and efforts to define it or explain it are less likely to be satisfactory. Efforts to demonstrate types of comprehension, for example, have produced sub-measures that typically do not hold up well in empirical studies. The scores on comprehension sub-scales typically intercorrelate at about the level of their reliability, leading us to question whether they are all really measuring the same thing.

Recent efforts to understand comprehension by means of an analysis of the syntax show promise in understanding the nature of language, and perhaps will lead to better understanding of the comprehension process, but do not solve our measurement problems yet.

In a sense, we are measuring comprehension in all parts of all reading tests, if we consider the underlying process and use the word comprehension in its general meaning to understand. Presumably, the rate measure gives us some notion of the speed with which the reader understands the material. Retention measures also presume that the reader has understood the material and has retained some facts. Few will disagree that vocabulary knowledge is necessary for the comprehension of reading material.

What, then, are we measuring when we present the student with the usual comprehension test consisting of a set of short passages followed by questions? And how does the result of such a performance relate to the other aspects of the reading process? We are not prepared to give a definitive answer to the first question concerning what we are really measuring. However, it seems clear that in some sense reading comprehension occurs at several levels, and we believe that the typical reading comprehension test gets at a higher-order set of behaviors than simple literal understanding and retention of detail.

The student is asked questions concerning main ideas, relationships among ideas, conclusions that can be drawn from the passages, and in some cases is asked to deal with the author's purpose and general approach.

As the questions require more and more manipulation and interpretation of the information given, they seem to become more involved with a reasoning process in addition to the passive reception of the author's message. At some point it is difficult to say whether we are measuring reading ability or general verbal reasoning ability.

As we turn to the other question concerning relationships among various reading test measures, we are fortunately able to examine some empirical data. The data to be presented are the result of several concurrent validity studies done in connection with the standardization of a new reading test, the *Minnesota Reading Assessment* (MRA).

The MRA is designed for administration to students in community colleges, business schools, technical schools, and other secondary and post-secondary training institutions. It is intended to measure the students' competence in those reading skills which are most relevant to school success. The test, available in two forms, A and B, measures *Reading Rate and Retention, Vocabulary,* and *Paragraph Comprehension.* Working time is 40 minutes.

The MRA was developed to provide information that would identify students who are in need of remedial assistance. The stimulus materials in the test are especially selected so as to be real-world oriented, vocationally relevant content. The difficulty level is such that the test will discriminate best on the students in the lower portions of the distribution, where judgments about remediation are usually made.

Normative information is provided on (1) students in vocationally oriented programs, (2) students in community colleges, (3) students in four-year colleges, and (4) hearing impaired students.

Reliability Studies

In a study of the internal characteristics of the instrument at the University of South Carolina's College of General Studies, Columbia, 95 students were studied. Fifty-one took Form A and 44 took Form B. Reliability estimates resulting from that study are: Cronbach's Alpha (.917, .934); Horst (.924, .941); Kuder-Richardson 20 (.917, .934); and Kuder-Richardson 21 (.900, .920) for Forms A and B, respectively.

In another study, interform reliability was studied using data from a sample of 24 students at the University of Wisconsin-Stout, in Menomenie, Wisconsin. The resulting correlations relating form A to form B are as follows: rate, .76; retention, .53; vocabulary, .83; paragraph comprehension, .57; and total score, .82.

Intercorrelation of Part Scores

In a study of 101 freshmen students attending the University of South Carolina's College of General Studies in 1980, 53 students took Form A and 48 students took Form B of the MRA. The part-score intercorrelations are shown in Table 1.

During the process of standardizing the test, it was possible to assemble data regarding performance on other reading tests on the part of the students in the standardization sample. Such concurrent validity data form the substance of this report.

Studies were done at the University of South Carolina's College of General Studies' Developmental Center in Spring 1980 to determine the relationships between scores on the *Minnesota Reading Assessment* and two other standardized tests, the *Nelson-Denny Reading Test,* Form C and Form D, and the *Stanford Diagnostic Reading Test, Blue Level.* We were interested in seeing the correlations between these instruments and the MRA, and were also interested in the relative difficulty of the tests. The population for these studies consisted of freshmen students mandatorily enrolled in effective reading classes due to SAT verbal scores below 390 and freshmen students referred to the Center for reading or study skills assistance because they were observed by faculty to be having academic problems.

The Nelson-Denny was selected as one of the comparison tests because surveys in community college reading and reviews of the literature have indicated that the Nelson-Denny is the most widely used reading test for that population (Goodwin, 1971; Sweiger, 1972; Landsman and Cranney, 1978; Flippo, 1980a).

The Stanford Diagnostic, Blue Level, was selected because it was developed to meet the reading assessment needs of grade 9 through junior/community college students, particularly of low-achieving students, and has norms for the junior/community college group. Van Roekel (1978) in *The Eighth Mental Measurements Yearbook* stated "The SDRT has few peers among group diagnostic reading tests" (p. 1299).

Correlations With Other Reading Tests

Criterion-Related Validity

In the University of South Carolina study, comparing the MRA with the *Nelson-Denny Reading Test* to determine the relationships between scores, 53 students took Form A of the MRA, and 48 students took Form B. All students had previously taken the *Nelson-Denny Reading Test.* Table 2 shows the Pearson Product-Moment Correlations between the MRA and the NDRT.

In the related study at the University of South Carolina, 89 students took both the MRA and the *Stanford Diagnostic Reading Test, Blue Level.* Forty-four students took Form A and 45 students took Form B of the MRA. The correlations between the subtests of the MRA and the SDRT ranged from low correlations to moderate correlations. The magnitude of the correlations were not the same for the forms of the MRA.

In a different study at the University of Minnesota, 122 students took both Form A of the *McGraw-Hill Basic Skills System Reading Test* and the MRA. The Pearson Product-Moment Correlations between the total scores on the two were as follows: Form A (r = .72) and Form B (r = .82).

In another study at Lakewood Community College, [illegible] students took Form A of the MRA and Form C of the *Nelson-Denny Reading Test.* The correlation between total scores was .79.

Relative Item Success Study

One way of looking at the appropriateness of a reading test for a given population can be students' ability to finish at least half the test correctly. As part of the University of South Carolina's study, we looked at the number of correct on each subtest of the Stanford Diagnostic, Blue Level, the Minnesota, and the Nelson-Denny. Students were grouped as "correctly answering less than half of the test items" (49% correct or less) or "correctly answering half or more than half of the test items" (50% correct or more). Table 3 shows the data gathered from this study of relative item success on the three tests.

Results

On the subtests of the Stanford Diagnostic, more students were successful at completing half or more than half of the test items on each subtest. However, there were enough that could not answer half of the items correctly, indicating that this test does discriminate well for lower-achieving freshmen students and for those in somewhat higher ability groups in college reading improvement situations.

On the subtests of the Minnesota, most of the student could successfully complete half of the items. (This could lead to the implication that the Minnesota might be considered "easy" for these students.)

On the subtests of the Nelson-Denny, most of the students could not be successful on half of the items, especially on the vocabulary items.

Implications

The Stanford Diagnostic is a good group diagnostic test and does discriminate well for this population. We are not surprised by its item success distributions, since a good diagnostic test for this population should look like this. We suggest that the Stanford Diagnostic, Blue Level, is one test that could adequately be used to get a more diagnostic picture of each students' reading abilities and inabilities prior to prescription in college reading improvement programs for the less than adequately prepared students. (Also see findings in Flippo, 1980b for more informaton on SDRT for diagnosis.)

The Minnesota and Nelson-Denny are not as diagnostic as the Stanford. They are survey tests and are designed to give the screener a general estimate of where a student stands. Is he or she in need of help or not in need of help? This should be asked if the student is being tested to see if he or she requires reading skills assistance. Or is he or she an excellent reader or not very excellent reader? This should be asked if the student is being tested to see if he or she should be matriculated into a special course or program where reading excellence can screen one in or out of a program.

From our observations, the MRA has low item difficulty and identifies students having real problems with weak skills. These are students in need of reading remediation in order to have a chance to succeed in a community college program. Tittle and Kay, in a paper presented to the American Educational Research Association in 1971, called for a test that could adequately identify the lower half of the achievement distribution. The MRA can do that.

From our observations the NDRT is much too difficult for this population and is not an appropriate test to identify students who need help with reading skills in a less than adequately prepared group. It undoubtedly causes frustration and loss of esteem to students who are already frustrated by their academic abilities. The NDRT has a very high item difficulty level and is excellent for identifying highly skilled readers.

Discussion

Some interesting relationships appear. For one thing, in spite of extreme efforts to make Form A and Form B of the MRA as parallel and equivalent as possible, some real differences appeared in comparisions with other tests. Form B is consistently more highly correlated with the Stanford, the McGraw Hill, and the Nelson-Denny.

The vocabulary measures also are interesting. The various scores labeled "vocabulary" correlate with the MRA vocabulary score at moderate levels, ranging from .39 to .74. However, the vocabulary scores on other tests correlate with the MRA total score at consistently higher levels, ranging from .41 to .80.

Measures labeled "comprehension," on the other hand, correlate with MRA Paragraph Comprehension from .43 to .60 (X = .51). They correlate with MRA Total score from .33 to .61 (X = .48). This pattern, even though the differences are not great, shows a reversal of the pattern of vocabulary scores.

We do not feel that there are any very surprising results in any of this, except possibly the high correlations between Stanford comprehension and MRA Rate. One purpose of the studies was to examine the concurrent validity of the MRA. We conclude that such validity has been demonstrated at about the level usually shown by studies of nationally standardized tests.

As a result of the relative item success study, we found that the MRA is quite easy for the freshmen population in a reading improvement program at a major state university. (It should be pointed out that the MRA was designed for the technical and community college student population.) However, we feel that "easy" is to be preferred to "difficult" when the screener is interested in testing to see who has real reading skills problems and just how weak those skills may be.

The relative item success study suggests a need for yet another new survey instrument that could adequately measure students in college reading improvement programs reading above the MRA level but below the Nelson-Denny (probably in the 9th to 12th grade range). A test like that would show distributions similar to those shown by the SDRT with the same population.

Finally, before one decides between the NDRT or MRA or any other reading test, one must know why it is being given and to what population. One should also consult a reliable source, such as a current Buros to see what reviewers say about the difficulty of test items on all instruments being considered. With that information in mind, we think that a good selection of tests can be made. If you want to see who has weak skills, use something that discriminates among low ability students. If you want to see who your very good readers are, use something that discriminates among higher ability students.

We do not think our studies have shed much light on the nature of "comprehension," but we do feel that we have supported the need for appropriate tests to measure reading comprehension for different ability groups.

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Table 1

MRA Scale Intercorrelations

	Rate	**Retention**	**Vocab.**	**Para. Comp.**	**Total**	**Rate**	**Retention**	**Vocab.**	**Para. Comp.**	**Total**
Rate	1.00	.09	.37	.20	.34	1.00	.32	.41	.35	.46
Ret.		1.00	.20	.40	.54		1.00	.41	.52	.67
Voc.			1.00	.52	.91			1.00	.41	.92
P.C.				1.00	.75				1.00	.67
Total					1.00					1.00

Table 2

Correlations Between the Minnesota Reading Assessment and the Nelson-Denny Reading Test

	MRA — FORM A					MRA — FORM B				
NDRT	**Rate**	**Retention**	**Vocab.**	**Para. Comp.**	**Total**	**Rate**	**Retention**	**Vocab.**	**Para. Comp.**	**Total**
Rate	.42	-.11	-.07	.01	-.08	.39	-.17	.10	-.01	.03
Voc.	.34	.11	.39	.37	.41	.47	.18	.54	.15	.48
Comp.	.21	.24	.21	.43	.33	42	.45	.51	.50	.61
Total Score	.31	.21	.34	.47	.42	.52	.36	.61	.37	.62

Table 3

Relative Item Success on the Stanford Diagnostic Reading Test — Blue Level, Minnesota Reading Assessment, and the Nelson-Denny Reading Test — Forms C and D

	Literal Comprehension (SDRT)	Inferential Comprehension (SDRT)	Word Meaning (SDRT)	Word Parts (SDRT)	Phonetic Analysis (SDRT)
Total Number of Students	127	127	127	127	127
Correctly Answered less than half of the test items	47	26	21	20	38
Correctly Answered half of the test items or more	80	101	106	107	89

Table 3 (continued)

	Structural Analysis	Scanning & Skimming	Fast Reading	Retention (MRA)	Vocabulary (MRA)
Total Number of Students	127	127	127	114	114
Correctly Answered less than half of the test items	21	40	64	16	16
Correctly Answered half of the test items or more	106	87	63	98	98

	Paragraph Comprehension (MRA)	Vocabulary (NDRT)	Comprehension (NDRT)
Total Number of Students	114	127	127
Correctly Answered less than half of the test items	9	114	84
Correctly Answered half of the test items or more	105	13	43

REACTION: VARIETIES OF COMPREHENSION MEASURES

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Measurement Problems

The authors present validation results on a new reading test in an effort to alleviate one persistent problem encountered when reading professionals debate the measurement of the reading act. Their insightful discussion of the implications of measuring *reading comprehension* mirror the frustration of researchers who endeavor to assess that for which there is no definition.

How, for instance, can a measure of vocabulary knowledge be removed from any measure of comprehension? Aren't these, in fact, the same constructs? They differ, perhaps, in the number of units involved, but is not *knowing a word* a form of comprehension? The higher correlations between vocabulary subtests and most comprehension subtests in contrast to lower correlations between the varieties of subtests of comprehension tend to underscore the overlap between vocabulary and comprehension.

Why do subtests of Paragraph Comprehension tend to have such depressed correlations? Could various tests be tapping differing content? Varying student performance levels would be expected depending on their differing mastery of background concepts; this would result in lowered correlations. Could syntactical features, as yet fully identified, be left uncontrolled? Presumably various authors' writing styles would reflect varying levels of syntactical difficulty rendering passages differentially difficult and depress correlations .

Another tact might question whether we are measuring comprehension validly with the familiar short paragraph, multiple-level question format used in most standardized tests. Is this reflective of a realistic reading context? Does the abbreviated, tight format and the syntax of the written multiple-choice comprehension (which varies from the syntax of the orally-presented conversational question) validly measure actual reading comprehension? The authors suggest that we may be tapping constrained verbal reasoning, as opposed to actual reading comprehension.

The new reading test, the *Minnesota Reading Assessment (MRA)*, speaks to a final consideration: the intent of current tests of reading. Most current tests endeavor to measure how *well* a student reads. They are measures of achievement related to reading. This presents a problem for the practitioner who deals with low-level classes. The middle school reading professional, for example, cries desperately for off-level norms to evaluate growth by means of standardized tests. When students are given the appropriate test for grade level placement, students fall in the lower quartile in both pre- and posttest measures, showing no growth when tremendous growth might actually be the case. And the standardized tests do not reflect realistic content—in fact, there is an effort to use contexts *unfamiliar* to the student to minimize the interference of background knowledge. These tests, in their academic orientation, are not useful in identifying the functional illiterate—the student who is in functional need for remedial assistance. The authors suggest the *MRA* as an alternative.

The Minnesota Reading Assessment (MRA)

The MRA, then, is intended to be a form of functional literacy test designed to identify, of those students in vocational program, community colleges, and similar programs which are functionally remedial. That is, which of the poor readers will be in jeapordy as they attempt to interact with reading in a real-world situation?

The process of validation of the *MRA* revealed some interesting contrasts with the more widely used *Nelson-Denny*, *Stanford*, and *McGraw Hill*. The relatively high correlation of *N-D*, *Stanford*, and *McGraw-Hill* vocabulary measures with *MRA* total test scores underscore previous measurement considerations related to subtest overlap. The higher correlations of vocabulary subtest correlations with comprehension subtests is not found in these validity data, however, further confusing the issue since comprehension subtests on the various instruments have a relatively high (X = .51) correlation.

The validation studies comparing *Stanford Diagnostic Reading Test* (SDRT), *Nelson-Denny* (ND), and *Minnesota Reading Assessment* (MRA) test results indicate that a different population of students is tapped. Of those readers assessed as remedial on the SDRT and ND, a much lower percentage would be rated as functionally remedial on the MRA, evidence that the MRA does, as intended, identify more closely a subgroup of functionally remedial students within the lower quartile of poor readers.

THE PROCESSES OF READING COMPREHENSION IN ELEMENTARY CHILDREN; RESEARCH RELATED TO INSTRUCTIONAL STRATEGIES TO PROMOTE COMPREHENSION

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Researching the research on reading comprehension inevitably yields for the researcher two essential yet interrelated concerns. The first pertains to measurement while the second concerns teaching reading comprehension. The measurement issue is paramount because any meaningful measurement must be predicated on definition. Without a mutually accepted definition, the teaching of reading comprehension is subject to myriad subjective interpretations by those professing to teach it.

Current literature provides the searcher with a wide array of viewpoints about the nature of comprehension. The more traditional approaches tend to fragment the process into several components or parts. The specific number of fragments ranges from a few to several many times over (Hunt, 1957; Aaron, Flynt, 1980). More recent treatments tend to view comprehension in more psycholinguistic terms, i.e., the syntax, semantic, rhetoric syndrome (Simons, 1971). The most recent references deal extensively with story comprehension (schematic or story grammar) (McConaughy, 1980).

It is significant to note that for all the miles of print on the topic of comprehension little reference is made to silent reading efficacy and its connection to the construct "reading comprehension" (McConaughy, 1978). Truly you cannot have one without the other. Ironically, the interrelationship of the two has never received just treatment in the literature (Hunt, 1977).

Research: Measurement of Reading Comprehension

What does research say about measuring reading comprehension? More specifically, can the several specific factors of reading comprehension, as so frequently described by various authorities, be precisely defined through meaningful measurement? The answers, as revealed in the literature, are three: YES! NO! and MAYBE!

The YES position is proclaimed by a few researchers (Davis, 1944) but significantly, the relatively few studies claiming to identify several specific discrete factors, do not go uncontested by others. Such critics present evidence that only one or two generalized concepts of comprehension are, in reality, being measured (Thurstone, 1946; Spearitt, 1972-1973). So the NO position is held by most researchers when the measurement of several specific factors has been purported (Hunt, 1957). Thus, the MAYBE position is held by most with the qualification that comprehension beyond the literal level be limited to one or at most two so called higher level thinking elements, i.e., inferential, evaluative, reasoning, etc. Thus, to date, measurements of specific comprehension elements have not been conclusively revealed through research. More recently, some researchers have attempted to differentiate between categorically different groups of readers, i.e., beginning-mature, high-powered—low-powered, etc., rather than trying to delineate specific factors (Golinkoff, 1975-1976).

So after decades of research on reading comprehension the reader of research remains in the privileged position of being able to choose from among several disparate positions and enjoys generous amounts of supporting literature to buttress that position. For many professionals, the construct 'reading comprehension' can be bewildering. One recent review of research states unequivocably that "How readers comprehend written materials is still largely a mystery" (Weaver, Shonkoff, 1978).

Research: Teaching Reading Comprehension

Can reading comprehension be taught? If the measurement of reading comprehension remains controversial and unresolved can we teach it? The question is crucial. The response from research review, while more positive, must remain: YES! NO! or It All Depends!

YES, obviously we are teaching literal comprehension and concurrently providing endless exercises and practice drills on the several presumed to be specific skills describing so called higher level comprehension, i.e., inferential, evaluative, etc. NO!, some observers hold that, for the most part, teaching reading comprehension seldom exceeds the literal level (Durkin, 1978-1979). Such authorities have advocated for decades that the 'inquiry process' utilized by teachers ought to transcend the literal level. There is little evidence to date that teachers, in general, escape from the literal level to any considerable degree. This state exists despite endless pleas from professional authorities for teachers to do otherwise (Wolfe, King, Huck, 1968). That teacher inquiry (questioning) ought to address inferential and judgmental as well as literal inquiry has not materialized (Guszak, 1967). Similarly and perhaps more significantly, insufficient attention has been given to imagery. Nor is it likely that conditions will change as long as current educational and classroom environments persist. Thus, the fact remains that the generalized construct "reading comprehension" continues to be ill-defined, imprecisely measured, and questionably taught.

Perhaps a different treatment is in order. Accordingly, the purpose of this paper is to propose a somewhat novel position relative to the problems of definition, measurement and development of "reading comprehension." This perspective is predicated on the interactions between the process of silent reading and the construct "reading comprehension." The initial premise defines the "good reader" in terms of good "silent reading." Good silent reading implies awareness of and proficiency in two distinct and discernably different forms of silent reading (Hunt, 1974).

Two Silent Reading Forms

Silent reading efficiency can be delineated in terms of two substantially different processes. The first, the one more commonly the concern in the professional literature, is characterized as INTENSIVE. The second, rarely treated in professional literature, may be labeled EXTENSIVE. The first is school-based or textual in orientation; the second is more frequently home-based and personal.

In-school (in-house) and out-of-school (out-house) uses of silent reading are manifestly different and need to be so recognized. This is a reality that most professionals have not yet confronted. Strange (1980) alludes to a duality in terms of a continuing "debate among reading experts about whether the reading process is primarily top-down or bottom-up." He indicates that "these positions are also referred to as concept-driven (top-down) and textual-driven (bottom-up). After laboring mightily with the topless and bottomless (perhaps mooning) theories, he credits both Rystrom (1977) and Rumelhart (1976) with deriving a compromise position which is best termed "interactive." But his major concern remains primarily with school-based silent reading comprehension (bottom-up or intensive) and provides no real breakthrough relative to out-of-school (top-down, non-text) comprehension or extensive reading. Stanovich (1980), following consideration of bottom-up and top-down models, amplifies on the "interactive compensatory model." He does so to such an extent that he becomes hopelessly entangled in detail about word recognition vis-a-vis comprehension only to conclude in general terms that which most professionals have recognized for a long time. Namely, that good readers, as a consequence of "rapid context-free recognition ability" possess more attentional capacity—for integrative comprehension processes." Thus, while vague and indistinct on the matter, his concerns are essentially on reading textual material, i.e., in-school; and he never confronts the issue of out-of-school silent reading.

In all recent research no conscious attention is being directed to the process of silent reading. No definitive distinction has been made between two discreet forms. Such a distinction is needed.

Definition of Silent Reading—Look-Think-Intensive

In this instance, the silent reading process is characterized by use of a Look-Think response. For the most part, silent reading is truly silent, although intensive in nature. Thinking meanings in response to words seen, rather than responding by hearing or voicing words separately, occurs at this level. Instantaneous whole word recognition at a very high level is implied.

At the intensive level of silent reading, however, every word is Look-Thought in serial fashion. In doing so, the left to right and line-to-line progression is dutifully adhered to. Conventions underlying school-based silent reading hold that books (any printed selections) are read from front to back, first page to last, first word on the page to the last, until all words have been recognized (presumably correctly) and all information is gathered in and remembered. Tradition has it that print is to be read in this linear sponge-like fashion.

To insure mastery of textual content, teachers have adopted a sort of stop and go approach to processing printed matter by all learners within their charge (Hunt, 1979). Typically, the reader is directed to start reading on command a segment of the text (basal or content) and then, at a designated place, to stop: Red Light! Following sufficient quizzing, the reader proceeds accordingly until stopped by the next Red Light (more quizzes) then on and on—Green Light! Red Light! until the textual content is completed. Of course, the slower the pace of the reader, the greater the number of stops and starts. Frequently, the result is that more time is spent on testing than on reading.

This stop and go approach governs most, if not all, school-based reading. All words are recognized, all ideas are remembered and recalled. Good reading is characterized as total absorption of the content. One succeeds accordingly by getting all ideas from all words wherein the criterion of correctness is pitched at a very high if not perfect level, i.e., mastery. The expectation is that each reader will sweep up all content in sequential linear progression from start to finish.

Accordingly, the effort to recreate the unfolding pattern of ideas is only partially successful for most readers. A relatively few are highly successful. A great many falter badly. Too much burden is placed on memory. Intensive reading occurs as a natural consequence if and when the purpose for reading is to remember everything and to absorb content totally. What is significant to note is that all ideas are treated as if each is of equal worth to all others. And, of course, all ideas are not equivalent in value for any response other than for a literal recounting of the material. The result is generally slow albeit fairly efficient silent reading in terms of school-based purposes (bottom-up).

The side effects of intensive silent reading can be disastrous in that many readers become compulsive about reading everything. They live under the fear of 'missing something' unless they monitor all the print. For them, reading is more often burdensome rather than pleasurable. Too many find reading too laborious. Many become lost souls in so far as other more personal forms of silent reading are concerned.

Definition of Silent Reading—Look-Think-Extensive

In this instance, silent reading is best characterized as an efficient thought gathering process. It is idea-centered rather than word-centered. Extensive reading is based on the premise that all words and all ideas are not of equal worth; that there is a relativity of merit among words or word groupings (concepts) and the ideas conveyed by them. By searching out key words and by attending to those words and word groupings which are power-packed with meaning, the reader reconstructs, orders and reorders important ideas rapidly. Meaning is arranged within a larger framework of relative worth and importance of ideas to the reader (Hunt, 1974).

Experiential reading means searching for meaning that matters; it is a Hunt-For-The-Big-Ideas activity. It is much more than merely accumulating every idea, word-by-word, and line-by-line. Much of the less consequential is forgotten and forgiven. As in panning for gold, much of little worth is glanced at and thrown away. The experienced reader learns to discern rapidly the nuggets of value. The process is holistic in the sense that lesser ideas become satellites to the significant ideas as planets to the sun. Reading comprehension, in the finest definition of the term, becomes a process of making a series of judgments about the worthwhileness of ideas.

Look-Think-Extensive silent reading, to be truly efficient, requires instant sight word recognition to a very high degree. However, even the clumsiest reader in terms of word recognition can attempt this process. By searching out some words that are recognized even the poorest performer can find some ideas of personal significance. All readers should be encouraged to realize how the process of efficient silent reading operates no matter how inefficiently applied. Concerned teachers need to explain the procedure to the low-powered readers no matter how feeble the outcome.

Two Forms of Comprehension

Once the premise of two forms of silent reading is accepted, it follows that there are two corresponding forms of reading comprehension. One is more concerned with remembering; the other with understanding. When reduced to simplest terms, one form of comprehension serves someone else's purposes; the other serves one's own purposes. No matter how you slice it the reader is either seeking responses previously predetermined as correct or appropriate by someone else or the reader is not. In the latter instance, the reader is satisfying only the self, and can be content with individual, personal, unique responses.

When the orientation is to comprehend an appropriate response as determined by others, then almost be definition, the reader must adopt the intensive form of silent reading. The extensive or experiential form of silent reading is used by accomplished readers when the purpose is personal. In this latter case, the printed material being read is usually self-selected.

Comprehension: Predetermined Responses

In the instance of reading to comprehend responses previously foreordained, the issue of the difference between literal versus inferential comprehension (or other so-named higher level thought processes) is subject to question. The instance of literal responses is relatively straightforward. The reader remembers, recalls, recounts or predicts the response designated as correct or the reader does not. But in the instance of inferential responses (however categorized or designated) it is not so easy to declare unequivocally the nature of the response.

This central issue must be addressed: Is an inferential response of the same qualitative character or caliber when the reader must infer a previously foreclosed response as when the reader infers a response which is soley individual and personal, i.e., when no other reader responds precisely in the same manner?

In school-based reading (whether bottom-up or top-down) the majority of inferential or evaluative responses call for a single (correct) answer which someone outside any particular reader's experience has established as correct or most appropriate. Most judgments about the power of a given reader to make inferences are made on the basis of the reader realizing the identical inference which the outside authority has previously deemed to be correct. Granted that readers or learners who are deft at realizing other persons' inferences are highly successful in terms of in-school reading (whether text-driven or concept-driven); yet such success can only be measured within relatively narrow parameters. How significant is the difference, in a realistic sense, between literal and inferential comprehension when in both instances the correct response has been preordained?

As long as the reader is expected to realize someone else's answers, pleas by professionals for open-ended inquiry by teachers will be largely ignored (Wolf, King, Huck, 1968; Durkin, 1978-1979; Guszak, 1967). As long as priority is placed on remembering, recall, recounting or predicting that which is read, questioning will focus on evoking single correct responses regardless of designation, literal or inferential. This fundamental fact of life is so primarily because single correct responses yield much more readily to measurement and, currently within the educational world, measurement is our master. Mastery approaches demand measurement.

Mastery learning of material selected by someone other than the reader is still mastery learning. Obviously, the intensive form of silent reading accommodates the requirement of mastery learning far better than does the personal, experiential form of silent reading.

Comprehension: Individual Responses

In extensive or experiential reading (Look-Think-Extensive) wherein the response is uniquely individual, no two readers will necessarily respond in exactly the same way. Granted, highly similar responses usually emerge at the literal level of comprehension but, for inferential or evaluative levels, reactions by various individuals will vary widely to the same printed material. There is no necessarily singular correct inference common to all.

Herein lies the rub. Variability among individuals in terms of inferential responses defies easy measurement. The quality of the response can only be judged. And who is to judge: Researchers? Teachers? Both are increasingly hesitant to do so while under pressure to provide precise measures, i.e., competencies, mastery, grades, etc. Consequently, the practice persists of using school-based criteria (bottom-up, text-driven) to evaluate inferential responses of a personal nature. This is a contradiction of forms which confuses the issues and leaves both teachers and readers in limbo. So has it been in the past and seemingly it will continue to be so in the immediate future.

Until the out-of-school form of comprehension (top-down), becomes recognized and incorporated as a legitimate part of the reading curriculum, little more than lip service will be granted to personal, experiential responses. Inquiry will remain predominantly at the literal level. The great irony is that most professional educators (and that includes teachers) use experiential silent reading out-of-school forms for personal reading yet avoid bringing such forms within the boundaries of the classroom, to say nothing about teaching such forms to incipient readers.

Remembering versus Understanding

There is a real difference in orientation between Reading-to-Remember as contrasted to Reading-to-Understand. Stated in simplest terms, in-school reading comprehension places a high premium on remembering (recalling, recounting and predicting). Conversely, personal forms of comprehension ought to focus on understanding with the broad latitude of individuality of responses this implies.

Until any reader reframes the implicit question which governs purpose in reading from: DO I REMEMBER? to DO I UNDERSTAND? each will be imprisoned by the restrictions attendant with Reading-to-Remember. Once the question to the self is transformed to DO I UNDERSTAND? then the reader can be freed to engage in extensive experiential forms of comprehension. This latter position has never been fully communicated to emerging readers within the context of "teaching reading comprehension." Many readers leave school totally innocent of this distinction.

All professionals, from the most elevated theorists to the lowest practitioners, are imprisoned within the confines of prevailing conventions. The Reading-to-Remember orientation is so pervasive and powerful that relatively few gain freedom from it at least from school-based instruction. The school-based stranglehold is simply too overwhelming. The horizons of all professionals need broadening to encompass the concept of Reading-to-Understand—as well as Reading-to-Remember. A balanced approach is needed. Those learning to read must be so enlightened.

The Liberated Readers

Who are the liberated readers? Unfortunately, our most versatile readers, readers accomplished in both silent reading forms, represent roughly the top third of our young reader population. Or our older reader populations for that matter. They have learned experiential forms of comprehension (top-down concept-driven) in other than school environments. Most engage in enormous amounts of personal silent reading; a private form of silent reading practice (Private USSR, Hunt, 1979). They have indulged in some form of "flashlight reading" and by doing so, have transcended the narrower restrictions associated with school-based comprehension. Regardless of confining concepts of comprehension practiced in school-based reading, these emerging readers will break those bonds. Their responses to the endless variety of ideas embedded within printed matter will be endlessly varied and experiential. Their central concern is with understanding not remembering.

The professional tragedy is that most of the other two thirds of our young readers will never know. Most will leave school with little or no awareness that there is 'another way'. Many entertain guilt feelings with regard to other than the school-based form of comprehension. Most will have but the haziest notion that efficient readers have gained command of both forms. It is upon them that future oriented teaching of reading comprehension should center. The true challenge in teaching reading comprehension is to establish environments within school which encourage out-of-school sorts of responses, i.e., Reading-for-Understanding for those who otherwise will be deprived of the opportunity to do so.

The Teaching of Reading Comprehension

Far too much has already been written in the professional literature about teaching intensive forms of silent reading and school based comprehension. A plethora of advice to teachers exists for *teaching* conventional definitions of reading comprehension. For those professionals concerned with teaching extensive forms of silent reading and conceptual forms of comprehension the following commandments are offered.

1. A daily silent reading practice period (USSR, Hunt, 1967, 74, 77) is mandatory. Self-selection by the reader of printed material is important, but not necessarily required. The orientation to purpose for reading, as guided by the teacher, should be on understanding not on recounting or remembering.

2. Inquiry in this instance implies open-ended discussion which focuses on personal responses to ideas of relative worth and significance to the reader. Such discussion is a vital component of the silent reading practice period. Inquiry and discussions may be conducted within the framework of total group, small group, or individual settings. The principal focus of the inquiry must always pertain to the part or parts which reflect the greatest potency of meaning. There are a variety of ways to put the questions but, however stated, those responding should be forced to choose responses on the basis of relative worth from among sundry ideas or items encountered within the print.

Most readers have been conditioned to respond by recounting material read from beginning to end. Such responses must be prevented, sometimes even forbidden. Inquiry must stress forced choice of ideas or items of information. There should be little room for compromise in this approach. Inquiry of this sort is instrumental in shifting the reader's mental attitude away from merely remembering, recounting and predicting to one of searching and selecting.

For some, albeit gradually, the attitude of reading to understand emerges and becomes internalized within the reading pattern.

3. Imagery, the act of formulating pictures in the mind, is an essential element in reading for meaning (Witte, 1978). The following progression ought to be encouraged. With guidance, the reader should realize that printed words can be transformed into mental pictures, which in turn, can then be returned to verbal statements either oral or written. Efforts should be made to cause the resulting verbal restatements to be produced from the pictures formulated in the mind. Too much of our current effort remains at the verbal level, i.e., using words to recount words.

There is a wide range of facility among readers with respect to creating pictures within the mind's eye. Some are able to produce mental images of great clarity, something akin to creating within the mind's eye a continuous running movie picture in living color a la TV. At the other end of the continuum there are those whose minds remain blank in so far as pictorial imagery is concerned.

Such wide differences must be accepted and accommodated. Yet all readers need to be encouraged to transform the verbal to the pictorial to the extent possible and regardless of the degree of success. The attempt heightens the process of sorting out and judging ideas according to their relative worth.

4. The term "High Potency," (Thorndike, 1919; McConaughy, 1978) indicates the fact of relativity of meaning among the word elements comprising any given passage. In any communicative discourse (oral or written) certain particular words (or word groupings) contribute substantially more to the composite or total meaning than do others. In any given language segment, whether it be words, phrases, sentences, paragraphs, sections, chapters, etc., a relativity or hierarchy of worth exists. Responding to "high potency" elements enables the reader to sense these larger frames of reference. Through proper weighting, the inherent hierarchy of meaning embedded within the total passage is truly mirrored. Major ideas rise to the surface; minor details are subdued. Searching out the "big ideas" becomes the name of the reading game. Conceptual forms of silent reading comprehension become feasible.

5. Concept Development is basic to an experiential conceptual form of silent reading. For the young learner, meanings of words (singular or collectively), which in turn represent conceptualization of ideas, evolve over time and are gradually refined as part of the developmental growth process within the cognitive/language area (Pearson, 1978; Russell, 1961). Concept development, which is basic to meaning, is a dynamic, expanding, and evolving process and should not be thought of as a static, fixed, or finite entity at any point in time (Hunt, 1978).

Childhood concepts cannot be adult concepts. This fact must not be overlooked nor forgotten. Paying more attention to concept development from start to finish is imperative if greater overall growth in reading comprehension is to be realized. Concept development, more than any other factor, provides the broad, sweeping avenue to meaningful reading in terms of the "High Potency" construct.

Building concepts, simply put, is a process of sifting and sorting through a vast array of bits and pieces of information received from the neverending source of daily experiences. Eventually and ultimately, many particular bits of experience are checked out and found to be of little consequence. Such irrelevancies are discarded or downplayed and the emerging essential elements are weighted and organized. Given time, the significant essentials, properly selected and arranged, form a general principle. Subsequently, this principle is tested, retested, and refined until the generalized statement is realized in its most effective and operational form. Obviously, for many learners, final realization of the ultimate precept is never fully achieved. But, for a great majority of concepts, as well as for a great majority of learners, the ideation of many particulars into a workable whole, emerges. However incomplete and partial in terms of final formation concepts may be, they provide the building blocks whereby meaning in reading is realized.

6. Multiple Meanings of words play a significant role in conceptual reading (Hunt, 1978; Pearson, 1978). Many if not most high potency words have multiple meanings influenced by the different contextual settings within which they reside. Sensitivity to this basic fact is essential for concept development. Young learners need time to develop such sensitivity. The punster is the obvious example of one who has fun with "multiple meanings." It may sound punny to say so, but that form is the crudest employer of double meaning. Riddles and jokes follow closely in that they, too, frequently employ secondary or double meanings. It follows that employing these forms with young readers ought to be taken seriously and significantly rather than lightly and frivously (in an instructional sense); this fun and funny playing with language, however crude, provides a basis upon which more subtle connections may be better understood at a later time by the emerging learner.

7. Metaphor and Symbolism represent the most difficult, complex, and sophisticated conveyances of meaning. In the least complex sense, the reader must handle double meanings, the double entendre. In the most complicated sense, the reader must handle several layers of meaning often with remote and subtle connections. Frequently, it is a case of symbols representing symbols which, in turn, are representing symbols. Reality may lie somewhere within this hierarchy of symbolic representation. It may not. Characteristically, imaginative and fanciful thoughts are usually portrayed through metaphor and symbolism with little or no reality for an anchor.

It follows that the young learner needs extensive exposure to myth, fantasy, and imaginative literary forms. This is needed so that a background for interpreting metaphor and symbolism will be woven and embedded into the fabric of concept development, both conscious and unconscious. It should go without saying that such exposure is best accomplished through reading by adults to young learners. Of course, both didacticism and pendantry should be avoided at all cost while doing so. Simply explaining the symbolic connections is sufficient.

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REACTION: INSTRUCTIONAL STRATEGIES TO PROMOTE COMPREHENSION

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Lyman Hunt's distinction between intensive and extensive silent reading seems to be a valid one, often overlooked by researchers, teacher-educators, and teachers. Often teachers unwittingly require intensive forms of responses following what ought to be an extensive reading experience by asking a student to recall the plot or to remember details. The teacher who asks the student to read his/her favorite section, or to create an artistic replica of a favorite scene, is more in keeping with the extensive form of silent reading.

Hunt's distinction between stoplight and flashlight reading also seems valid. Perhaps flashlight reading outside school is necessary to develop the experience and habit of extensive reading. One wonders whether sustained silent reading alone (in-school) is sufficient to develop experiential forms of comprehension. The role that parents play in reading to their preschool and school-age children ought to be emphasized as an important means for developing the extensive form of reading.

The problem, however, is this: How can teachers and parents who have not experienced extensive reading convey this concept to children? Parents who do not habitually read (i.e., are not extensive readers) probably do not read much to their children. But what about teachers? Should teachers be screened from the teaching profession if they have not experienced extensive reading; or should an attempt be made to promote extensive reading in preservice teachers?

While most preservice teachers probably have experienced flashlight reading, an informal query of students that I have made every term for the past several years has revealed, in almost every class, at least one person who confesses to dislike reading and several who do not read voluntarily. In fact, a written survey (Trueblood and Askov, in preparation) of 107 preservice teachers' (elementary and special education) attitudes toward reading, given before their reading methods course at Pennsylvania State, has revealed a range in scores from 27 to 105 (possible Range = 26-150; x = 62.6; SD = 13.9). At the end of the reading methods course their expressed attitudes toward reading essentially stayed the same, indicating considerable variability in how preservice teachers feel about reading. We cannot assume that teachers feel positive toward reading or have experienced the extensive form of reading.

Can teachers who have not experienced extensive reading themselves promote it in their students? I am afraid the answer may be negative since their own view of reading is limited to the intensive form or bottom-up processing. On the other hand, reading methodology textbooks and instructors could make teachers aware of the distinction between the two forms of silent reading comprehension. With this awareness perhaps teachers could become more sensitive to students' divergent responses to literature whether as part of intensive or extensive reading. Perhaps they can learn to recognize when convergent responses are appropriate and when they are not.

Hunt's proposal to use imagery in concept development is an interesting one, and one that is recently being investigated. As Hunt points out, we all do not possess the same ability to visualize what is described verbally. Can a teacher who does not form mental pictures encourage them in others or understand their role in concept development? Regardless, teacher education courses should encourage this type of experience among students.

The reading program of the State College Area School District, as described in examples provided by Christopher Mare at the conference, does encourage the development of these processes. Reading and social studies are integrated into units. As students study the westward movement, for example, they are to imagine themselves making that trip. The imagery created helps the students develop the appropriate concepts of pioneer life. Intensive reading is taught through an "instructional book," a given library book selected at an appropriate reading level for each group, as well as through the "morning letter," a daily letter written by the teacher to the students containing important vocabulary and emphasizing the word recognition skills being studied in context. Extensive forms of reading are encouraged in daily sustained silent reading, usually with books fitting into the unit theme. As part of the process of sharing their books, students often create artistic projects, such as dioramas and murals, or act out characters or scenes from a book. Evaluative strategies are not applied to extensive reading but are reserved for intensive reading.

In conclusion, Hunt's distinction between the two forms of silent reading comprehension seems useful. The difficulty with implementing extensive reading and imagery is that they cannot be taught—they have to be experienced. A teacher who has experienced neither probably cannot appreciate the value for students. Nevertheless, teacher educators have a responsibility for presenting the distinction and offering guidelines for implementation.

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GLOSSING FOR IMPROVED COMPREHENSION: A NEW LOOK AT AN OLD TECHNIQUE

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In the paper I presented at the first general session of this conference (Otto, 1980), I alluded to an instructional technique that my associates and I are developing in the hope that it will ". . . help to improve (readers') comprehension—not just what we know about comprehending." Very briefly, the technique involves *glossing* expository text; that is, we are using marginal and other intratext notations—gloss—to direct readers' attention while they read. Neither the idea nor the term is new; both date back at least to medieval times, when theologians used gloss to illuminate biblical texts. What we are attempting to do is to systematize glossing procedures so they can be used with confidence, both formally, in preparing instructional materials, and informally, in face-to-face teaching in the classroom. In the paper I discuss some of the issues we have begun to deal with as we move toward systematic glossing.

Our experiences so far include (a) developing and trying out prototype glossed materials, (b) working with teachers and teachers-in-training to make informal applications of the glossing technique, and (c) examining selected studies that appear to have particular relevance for our continued efforts. We feel we have reason for optimism. Students report informally that gloss does indeed help them tackle the complex task of reading expository text. The teachers we have worked with are not only impressed by the high face validity of the prototype gloss activities, but they are also enthusiastic about using the glossing techniques informally when they teach from content-area texts. And we are satisfied that there is a related literature that offers both general support and specific implications for proceeding with the development of glossing procedures. [See Otto, White & Camperell (1980) for an extended discussion.]

We feel that we are now at a point where we have bases for giving serious consideration to the function of glossing as a technique for helping readers understand expository text and for refining our specifications for developing glossed material. In this paper I discuss, first, an admittedly idealized view of the function of gloss; then I consider the "focus" of gloss, acknowledging the need for a dual focus on both *process* and *content* as well as concern for certain constraints and considerations; and finally I outline some developmental steps for refining the glossing technique.

Function of Gloss

In my first general session paper (Otto, 1980) I commented on three alternatives reading educators have traditionally used in their attempts to help students comprehend: (a) modify the text; (b) augment the text; and (c) modify the students' reading behavior. I suggested that these alternatives share a common flaw: their focus is too limited. Emphasis is placed on the text, on the teacher (i.e., teacher-directed activities), or on the reader (i.e., reader-imposed behavior or strategies); and important interactions among all three are ignored. Then I suggested that an effective instructional technique ought to give concurrent attention to all three. In other words, the technique would bring together the diverse aspects of a complex teaching-learning process. We believe that, with development and refinement, the glossing technique can serve that integrative function.

Yet a truly effective instructional technique for helping readers deal with expository text must have two characteristics in addition to the integrative function. It must secure and sustain learners' active involvement; and it must provide for the internalization and application of the skills and strategies that are taught. Gloss activities can virtually ensure the former if they (a) acknowledge the learners' prior experience, or lack of it; (b) lay out a useful strategy for pursuing the learners' purpose; and (c) require overt, interactive responses from the learner. Whether gloss can effectively do more than set the stage for the latter remains to be seen. That is, gloss activities can straightforwardly call for the application of skills and strategies, thereby setting the stage for internalization; but ultimately internalization and automatized application with "unglossed" material go beyond the activities we can provide. The best we can do is to work out effective strategies not only for initiating but also for "fading" readers' involvement with the gloss activities. I return to this point in the final section of this paper.

Focus of Gloss

When we first began to consider the notion of glossing as an instructional technique, we thought of it mainly as a means for, first, developing and, then, encouraging the application of the specific comprehension skills we had identified in our earlier work. Some examples of specific skills we have worked with are (1) determining the central thought of a paragraph or of several paragraphs; (2) using context clues to figure out the meaning of an unfamiliar word; and (3) identifying relationships to make a conclusion. We still believe that glossing offers an effective way to deal with specific skills; but as we have examined related research and interviewed students, we have been convinced that we need to broaden our focus on skills to include the more general strategies that efficient readers use to understand text.

One example of a general strategy is consciously relating new information, as it is read, to one's prior store of knowledge or to information that was acquired from reading the preceding pages. Such a strategy is suggested in a variety of sources, which include the work related to schema theory, work by Smirnov (1973) and by Brown (1977) in the area of cognitive development, Kintsch's (1978) work on developing his model of comprehension, and the line of research related to readers' mathemagenic behaviors. The need for such a strategy is supported by our observation that when students were asked to describe what they do when they read to understand, some of them said that they relate what they read to what they already know or to what they had read previously. Another example of a general strategy is the practice of self-questioning, which is suggested by several investigators who are interested in metacognition. We also found in our interviews with students that some of them use self-questioning as a rehearsal strategy for remembering as well as for assessing and monitoring their own understanding of what they read.

Through gloss activities we hope, first, to help students become aware of the usefulness of these and other strategies and, second, to help them learn how and when to employ these strategies as they read content-area material.

Although we are mainly concerned with the process of reading content-area texts, we recognize that we cannot focus on process without considering content as well. Consequently, in addition to broadening our process focus to include strategies as well as skills, we acknowledge the need for a dual-focus on content and on process. While nobody can claim to be expert in every content field, one can apply the principles of text analysis to materials that were written by experts. Employing such techniques as mapping, outlining, or the more formal text analysis systems described by Kintsch (1980), Meyer (1975) and others, teachers who are generalists should be able to develop gloss activities that deal with important aspects of content. In other words, properly conceived gloss activities ought to be directed toward enhancing the understanding of specific text content even as they shape the development of "generalizable and internalizable" skills and strategies. The effectiveness of gloss activities that claim a dual focus on content and process, then, must ultimately be demonstrated by a specific (content directed) as well as a more general (process directed) effect: improved understanding of the glossed material and internalized skills and strategies that enhance readers' ability to tackle any reading task.

Up to this point in the discussion I have said that glossing text ought to have an *integrative effect* and that gloss must have *dual foci,* which direct attention to matters that are related to process and to content. If the preceding sentence sets parameters for glossing, then our task is to elaborate, clarify, and refine those parameters to a point where we can outline reliable procedures for preparing effective gloss. We expect to pursue that task. Figure 1, which depicts interrelationships as well as parameters, provides some direction. The explanation and discussion of Figure 1 that follows is an attempt to explicate some of the assumptions and concerns that are embodied in the figure.

Parameters and Interrelationships

On the perimeter of the figure, the content and process arrows of the dual focus flow toward the finished product: gloss (text augmented by gloss activities). The arrows are arranged and interrupted to indicate that even as the dual foci direct attention to both process and content, attention is also given to (a) the complex and interacting constraints and consideration of the learning environment, and (b) any possible need for "excursions" either to augment information in the text-at-hand or to enhance the learner's skills and strategies. First we offer some comments on the excursions; then we consider the constraints and considerations.

Excursions. By "excursions" we mean instruction that is offered in addition to the regular gloss activities provided for a specific text. One example, on the process side of the figure, is the kind of instruction offered to a reading skill-development group, where a given skill or strategy is taught intensively and in relative isolation from application in content-area reading. The point of such instruction is to introduce and to sharpen the learners' awareness of the skill or strategy and to provide opportunities for application. While we should attempt to design gloss activities that make for the acquisition as well as the application of specific skills and strategies, the fact is that certain readers and/or certain texts will require intensive preparation for working with the particular skills and strategies stressed in glossed text. (In fact, we suspect that the introduction and sharpening of most skills and strategies is most appropriately handled in such a manner. Whether this is so remains to be seen. The question of when and how acquisition proceeds to application—insofar as the main thrust of instruction is concerned—is an important one.)

An example of an excursion on the content side of the figure is instruction that is designed to provide basic background information or to elaborate or augment given information in preparation for reading a given selection of text. Again, the point is that certain readers and/or certain texts will require *additional* information as a precondition to working with glossed text. Of course the question of when an excursion is called for and when an anticipated lack of background information can be handled with gloss is another important one. It seems almost certain that if gloss gets bogged down with too much basic information it will become cumbersome and sluggish, thereby losing both its appeal and its effect.

Constraints and considerations. The constraints and considerations identified in Figure 1—Expectations, The Milieu, The Reader, and the Text—are, as we pointed out earlier, aspects of a complex teaching-learning process. It is important that all of these aspects, and the specific factors associated with them, be given consideration in preparing gloss activities. And, if gloss is to have the integrative effect that we are seeking, it is equally important that *concurrent* consideration be given to, at least, the most *potent* factors. Yet the reality is that the universe of factors is virtually limitless, so an important aspect of the task of establishing guidelines for effective glossing is to identify the ones that are likely to have the greatest impact in given situations.

Again, for the moment the aspects of the reading-learning process that are given in Figure 1 acknowledge the fact that factors associated with each of them deserve consideration and impose constraints on the glossing process. The specific factors and particularly the interactions among them, remain to be more fully understood in terms of their impact. Meanwhile, we have tentatively identified what seem to be some of the more important factors associated with the four aspects identified in Figure 1.

The nature of gloss activities must, of course, be shaped by the explicit and implicit *expectations* that can be identified. That is, the effectiveness of gloss will be largely determined by the extent to which it is in line with and contributes to the attainment of expected outcomes. Both the goals of the overall curriculum and the stated and unstated objectives of content-area teachers need to be considered to give the gloss direction and focus. The specific measures to be used in assessing outcomes also merit careful consideration, since we know that different measures may yield different results (e.g., Kendall, Mason & Hunter, 1980).

Consideration of specific factors in *the milieu* makes it possible to deal with the mundane but important matters that often make the difference between failure and success in planning instruction. One obvious factor is the time available; gloss prepared for one hour of available time would undoubtedly be quite different in terms of degree of elaboration and types of responses required of learners from gloss prepared for ninety minutes or two hours of available time. Likewise, gloss prepared for individuals and gloss prepared for groups *might* need to incorporate different directions and different types of activities in order to sustain interest and effective involvement. And of course gloss ought always to be prepared in view of the best technology available: the most appropriate techniques applied in the appropriate manner for a particular individual or group.

Many factors related to the reader could, and should ultimately, be identified and clarified. But most important for our immediate purposes are the reader's prior knowledge of text content (i.e., content knowledge) and the reader's knowledge of and ability to apply specific skills and strategies (i.e., process knowledge). The preparation of gloss—and decisions about when and how to take planned excursions—will be heavily influenced by both of these factors. Together, they, in effect, are the "givens" to which new information must be related for assimilation, accommodation, and application.

Similarly, the text is a given that can, presumably, be brought into closer juxtaposition with the reader through glossing. In order for gloss to bring the text and reader closer together, important concepts and ideas must be identified through some type of text analysis; likewise the skills and strategies students need to use in order to read a text must also be determined through systematic analysis. The identification of the important concepts and the skills and strategies needed to read and understand these concepts provides a more definitive focus for preparing gloss activities.

Stages of Gloss

While the immediate focus of gloss is on both content and process, the ultimate goal is to help students not only to acquire but also to internalize and apply the skills and strategies that enable them to be independent readers of the full range of materials they encounter. Norman, Gentner, and Stevens (1977) put it like this: ". . . if a child knows how to learn, then he can get the knowledge by himself" (p. 194). If gloss is to contribute to that goal of independence, then we need to do more than simply provide gloss that is effective in improving students' comprehension of text. We must also provide for the systematic internalization and fading of the support that is provided through gloss in order to help students to sustain their use of the skills and strategies when they are on their own. On the basis of our experience and observations so far, we envision four distinct levels or "stages" of preparing and interacting with gloss activities: (1) demonstration; (2) development; (3) internalization; and (4) fading. Each stage can be briefly characterized in terms of focus and function as we see them now.

Activities at the *demonstration stage* ought to create awareness of the different features of a text (e.g., things so mundane as chapter heads and subheads, and things so relatively esoteric as different organizational patterns and styles) and of the skills and strategies that can be used to read that particular text with understanding. The main function of the activities at this stage, then, would be to provide immature readers with models that approximate mature readers' perceptions relative to extracting meaning from text. That is, the gloss activities, or models, include reflections, queries and applications that lead students through some of the same thought processes mature readers experience as they read and study expository texts. Demonstration gloss activities describe what is—or ought to be—happening as one reads. Stated bluntly, we would hope that by preparing effective demonstration gloss we could develop students' enthusiasm for working with glossed materials. The goal is to win them over by showing them that it works and is worth the effort.

Just as demonstration gloss activities would provide descriptions of *what* is happening, gloss activities at the *development stage* would provide *explanations* that help students to develop an understanding of *how* to make active use of the skills and strategies they need to read and comprehend the content. As we see it now, gloss at this stage should include clarification of behaviors related to specific skills and strategies, explanation of how to use the skills and strategies, and opportunities to apply the skills and strategies in reading content-area texts.

At the *internalization stage* gloss activities would provide opportunities for students to continue to use the skills and strategies that were introduced and sharpened at the development stage in a wide variety of contexts. At this stage one can envision activities that are designed to help students move closer to independence by helping them move toward a level of metacognition. The activities would go beyond providing opportunities for application and practice; and the focus would be on developing students' awareness of *when* they could apply skills to understanding text and *which* skills and strategies might be more appropriate in different situations.

By the time students reach the final stage, *fading*, they will, presumably, have internalized the skills and strategies (i.e., they will have become aware of skills and strategies and be able to apply them in a variety of contexts). The function of the gloss activities, then, would be simply to remind readers to think about their own efforts to understand what they are reading, to think about the skills and strategies that help them to comprehend given information, and to correct any miscues or misconceptions that may be clouding their understanding. That is, to use a term from the work in artificial intelligence, gloss activities at the fading stage should remind students to "debug" their understanding (i.e., eliminate false perceptions) as they read. Students who reach the fading stage will, essentially, have attained the goal we set: they will not only possess the skills and strategies required to read content-area texts, but they will be aware of their ability to use the skills and strategies and know when and how to apply them.

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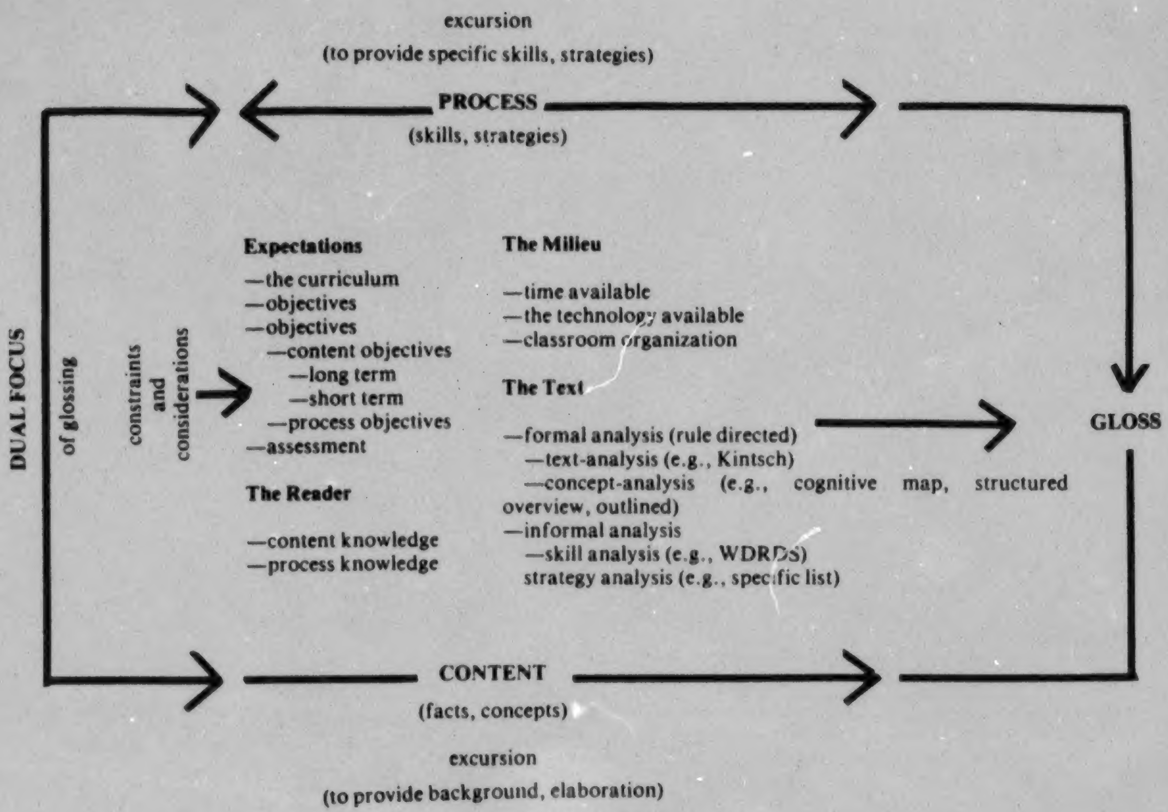
excursion
(to provide specific skills, strategies)
PROCESS
(skills, strategies)
DUAL FOCUS
of glossing
constraints and considerations
Expectations
—the curriculum
—objectives
—objectives
—content objectives
—long term
—short term
—process objectives
—assessment
The Reader
—content knowledge
—process knowledge
The Milieu
—time available
—the technology available
—classroom organization
The Text
—formal analysis (rule directed)
—text-analysis (e.g., Kintsch)
—concept-analysis (e.g., cognitive map, structured overview, outlined)
—informal analysis
—skill analysis (e.g., WDRDS)
strategy analysis (e.g., specific list)
GLOSS
CONTENT
(facts, concepts)
excursion
(to provide background, elaboration)

A MULTIVARIATE ANALYSIS OF PRINCIPLE AND TRACE ELEMENTS IN MATURE READING COMPREHENSION

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The study of reading comprehension effectively has been reduced to its most frequent operational definition: some variation on recognition-recall of graded passages. This conventionalized and delimiting construct seems to be understood about as well as it can be from previous studies. The search for trace elements in Conventional Reading Comprehension (CRC) would be unnecessary, for example, because it is a relatively crude construct. Spache and Spache (1975) have pointed out that recent factor analytic studies of reading comprehension, summarized, conclude that it consists of essentially three factors: a *word* factor, representing knowledge of word meanings; a *relationship* factor, reflecting the discernment of variously stated ideas; and a basic *reasoning* factor, referring to the drawing of direct conclusions and inferences.

Mature Reading Comprehension (MRC) is an alternate construct, more inclusive, and logically supportive of the intention of reading and education than is CRC. This study is addressed to the delineation of elements within MRC which are, and are not, synonomous with the conventionalized form of CRC, though undoubtedly are latent within it.

The term *trace elements* is intended metaphorically, here, to suggest the slight, or overlooked, factors and/or key relationships necessary to nourish reading comprehension to mature levels. If such elements could be found in reading comprehension, these would be expected to parallel the role(s) of potassium, zinc, and iron, in providing for continuous growth and fine tuning of brain and muscular functions. The reasoning underlying this possible analog was simple: an identical passage read by persons of seemingly comparable ability causes some to gain informational weight, others to formulate ideas, and still others to be sparked to higher levels of critical and creative thought; therefore, there must be some less than obvious factors operating to cause some persons to metabolize essentially the same information more fully and expansively than others. Thus, we imagined that subfactors, or trace elements, accounting for these puzzling differences were being drawn upon, and that the presence of these would become increasingly evident where fine tuning was required, as in critical-reading-thinking behavior, or mature reading comprehension.

Goals of the Study

One of the goals of this effort was to make the study of deeper levels of comprehension possible. To do so, comprehension was redefined as mature comprehension, and new relationships were projected which, if realized, would provide a significant level of validation for the new construct, and serve as a point of departure for subsequent inquiry into related questions, such as: are there optimal levels for certain elements, or factors; are there certain elements (or skills) which actually might be counter-effective at higher levels of intensity; are certain skills or elements needed in higher concentration at one stage of development than at another; and an array of related combinatorial questions, such as, what is the influence on certain skills and elements of environmental, temperamental, and situational factors?

This effort is part of a larger design to delineate better a concept and definition of overall reading maturity. Principally addressed in the larger study, and reflected in the current study, are questions concernihg the dynamics of continuous growth in reading, language, and learning, and the questions of whether these can be ferreted out for a given individual so as to be able to state that individual's peculiar mode of growth, as well as whether that individual is growing in a timely way. We refer to this more embracing construct as Progress Toward Reading Maturity (PTRM) to distinguish it from previous and related efforts (Manzo & Casale, 1979).

The test factors employed in the current study of principle and possible trace elements in reading comprehension are the same as those fashioned for the larger study.

Definitions

Both conceptual and operational definitions of reading comprehension and of mature reading comprehension are provided, followed by a description, in the method section, of the test factors employed, and the data analysis procedures selected.

Conceptual definition of Conventional Reading Comprehension: literal, inferential, and applied (in the sense of simple transfer) understanding of written expository.

Operational definition of Conventional Reading Comprehension: score on Test #6, Conventional Reading Comprehension, of the battery of test factors called ALARM, or Assessment of Language and Reading Maturity, experimental form II (Manzo & Casale, 1979): a conventional recall-based multiple choice question test on two brief passages (approximately 250 words in length, each), established to be of high interest to the intended audience. (This test had a .63 correlation with the Reading section of the Iowa Test of Basic Skills.)

Conceptual definition of Mature Reading Comprehension: all of the elements of conventional reading comprehension plus, (1) indications of growth in awareness of the undergirth of precepts which tend to govern much of that which is thought and written, and (2) a willingness and ability to think evaluatively, and in a clear and emotionally unencumbered way, about these.

Operational definition of Mature Reading Comprehension (MRC): unweighted combined score of Test #6, General Reading Comprehension; and Test #15, Critical Judgments-Continuous Prose on the ALARM battery. The Critical Judgments-Continuous Prose test requires that judgments be expressed on certain aspects of a continuous passage regarding: (a) the reasonability, judged against one's personal knowledge, of certain expressed views; (b) the general usefulness, or value, of a certain piece of information toward better understanding of the topic of the passage; (c) the internal logic of certain statements, (d) the balance—or denotative/connotative appropriateness—of selected words and phrases. (Score on this test is an index of the extent of agreement expressed by the student with standards established from the responses of a group of mature readers who were forced to reach concensus upon each item.)

METHOD

Subjects

Eighty subjects were randomly selected from a medium large, urban, 7-8th grade junior high school. The school population appeared to be heterogeneous in terms of race, socio-economic background, and intellectual-academic levels.

Variables

The variables of the study were the 15 test factors composing the ALARM battery. Reliability and validity of the test factors have been established in previous papers, dissertation studies, and articles (Manzo, 1975; Manzo, Lorton & Condon, 1975, 1977; Meeks, Eanet et al., 1976; Robinson, 1977; Martin, 1978). Table 1 displays the intercorrelations among these test factors, and Table 2 lists the correlations of Mature Reading Comprehension (the sum of Conventional Reading Comprehension and Critical Judgments-Continuous Prose) with each of the ALARAM test factors.

Legend
Descriptors, and Brief Descriptions of ALARM Test Factors

1. WrdRec: basic word analysis, or WORD RECOGNITION
2. Vocab: selection of VOCABULARY synonyms
3. Analog: reasoning with basic ANALOGIES
4. SynCpx: translation of sentences of increasing SYNTACTIC COMPLEXITY
5. ModClz: MODIFIED CLOZE passage completion
6. CRC: CONVENTIONAL READING COMPREHENSION as measured by multiple choice
7. GenKnl: GENERAL KNOWLEDGE, or range of facts and information
8. AbstVR: Application of ABSTRACT VERBAL REASONING to interpret proverbs
9. ElbThg: inclination toward ELABORATIVE THINKING
10. SEFac: SOCIAL/EMOTIONAL Factors, primarily appetitive motivation and emotional stability
11. TLRang: breadth of TEACHING/LEARNING RANGE
12. CEComp: degree of CULTURAL/EXPERIENTIAL COMPATIBILITY with expectations of school
13. CJUI: CRITICAL JUDGMENTS—USEFUL INFORMATION, evaluative estimates of the relative usefulness of certain facts and ideas
14. CJR: CRITICAL JUDGMENTS—REASONABILITY, evaluative estimates of the reasonability of certain statements
15. CJCP: CRITICAL JUDGMENTS—CONTINUOUS PROSE, evaluation of various specified elements of continuous prose

TABLE 1

Intercorrelations for 15 ALARM Subtests and Total ALARM Score
N = 80

	1	2	3	4	5	6	7	8
1Wrd Rec	1.00							
2 Vocab	.10	1.00						
3 Analog	.06	.03	1.00					
4 SynCpx	—.08	—.16	.03	1.00				
5 ModClz	—.09	.17	.10	.23*	1.00			
6 CRC	.00	.28**	.12	—.11	.23*	1.00		
7 GenKnl	.11	.19*	.14	.20*	.56**	.54**	1.00	
8 AbstVR	—.00	.22*	.14	.73**	.61**	.25*	.65**	1.00
9 Elb Thg	—.13	—.19	—.02	—.21*	—.03	—.03	.00	—.07
10 SEFac	.32**	.35**	.28**	.28**	.30**	.21*	.21*	.26**
11 TLrang	.12	.03	—.04	.13	.03	.11	.09	.08
12 CEComp	.14	—.03	.12	.13	.08	.22*	—.18	.09
13 CJUI	.34**	.44**	.58**	.51**		.50**	.08	.61**
14 CJR	.15	.16	.12	.33**	.31**	.14	.31	.27**
15 CJCP	.17	.26**	.35**	.47**	.45**	.44**	.30**	.53**
ALARM	.36**	.31**	.44**	.51**	.50**	.58**	.21*	.56**

*$p < .05$

**$p < .01$

	9	10	11	12	13	14	15	TOTAL

TABLE 2

Correlations of Mature Reading Comprehension (MRC) with ALARM Test Factors

N = 80

WrdRed	.25	ElbThg	.08
Vocab	.35	SEFac	.31
Analog	.42	TLRang	.15
SynCpx	.57	CEComp	.24
ModClz	.53	CJUI	.46
CRC	.68	CJR	.49
GenKnl	.29	CJCP	.96
AbstVR	.65	TOTAL	.71

TABLE 3

Multiple Regression Summary For Conventional Reading Comprehension on ALARM Test Factors

Variable	Multiple R	R^2	R^2 Change	Simple R	Beta
AbstVR	.69	.47	.47	.69**	.40
CJUI	.72	.52	.05	.59**	.22
SynCpx	.73	.54	.02	.59**	.20
CEComp	.74	.55	.01	.22*	.11
Vocab	.75	.56	.01	.45**	.13
ElbThg	.75	.57	.01	—.03	.10
CJR	.76	.57	.01	.14	—.12
WrdRec	.76	.58	.00	.37**	.09
Analog	.76	.58	.00	.44**	—.10
CJCP	.76	.58	.00	.44**	.04
SEFac	.76	.58	.00	.21*	.02
ModClz	.76	.58	.00	.50**	—.03
GenKnl	.76	.58	.00	.10	.02
TLRang	.76	.58	.00	.11	.01

*$p < .05$
**$p < .01$

TABLE 4

Multiple Regression Summary For Critical Judgments-Continuous Prose on ALARM Test Factors

Variable	Multiple R	R^2	R^2 Change	Simple R	Beta
CJUI	.56	.31	.31	.56**	.32
CJR	.70	.49	.19	.54**	.37
AbstVR	.72	.52	.03	.53**	.16
CEComp	.74	.55	.03	.20*	.21
ElbThg	.76	.58	.03	.11	.16
GenKnl	.77	.60	.02	.30**	.19
WrdRec	.78	.61	.01	.17	—.16
SynCpx	.79	.62	.01	.47**	.11
TLRang	.79	.62	.00	.14	.02
Vocab	.79	.62	.00	.26	—.03
GRC	.79	.62	.00	.45**	.04
SEFac	.79	.62	.00	.17	.02

*p <.05
**p <.01

TABLE 5

Multiple Regression Summary For Mature Reading Comprehension on ALARM Test Factors

Variable	Multiple R	R^2	R^2 Change	Simple R	Beta
AbstVR	.65	.42	.42	.65**	.27
CJR	.73	.53	.10	.49**	.27
CJUI	.78	.61	.08	.64**	.34
CEComp	.80	.64	.03	.24*	.21
ElbThg	.81	.66	.02	.08	.17
GenKnl	.82	.68	.02	.29**	.17
SynCpx	.83	.69	.01	.57**	.16
WrdRec	.83	.70	.01	.25*	—.10
TLRang	.83	.70	.00	.15	.02
SEFac	.83	.70	.00	.21*	.02
Analog	.83	.70	.00	.42**	—.03
Vocab	.83	.70	.00	.35**	.01
ModClz	.83	.70	.00	.53**	—.01

*p <.05
**p <.01

Data Analysis

The delineation of the principle and possible trace elements in Mature Reading Comprehension was conducted primarily through multiple regression analyses using a forward (stepwise) method for inclusion of independent variables. The objective of the analyses was to search for structural relations among the multivariate relationships presented in the ALARM test factors, rather than to select the fewest possible predictors. Therefore, the criterion values established for deciding which variables would enter into the solution were not restrictive. The F ratio of a variable to be entered on the upcoming step was set at .01. The tolerance level (T) was set at .1%. Finally, the number of variables to be entered in the formation of the predictor list was unrestricted except by the F and T levels specified above.

Three stepwise multiple regressions were generated. The first two, for comparison purposes, were of conventional reading comprehension (CRC) with all other ALARM test factors, and of Critical Judgments-Continuous Prose (CJCP) with all other ALARM test factors. The third was of Mature Reading Comprehension (MRC), the alternate construct, with all other ALARM test factors excluding CRC and CJCP which were summed to produce the MRC score).

Interpretation of the data essentially called for an examination of the list of variables generated for best predictors (principle elements); and then for second order predictors which had shown a low level of simple correlation with the criterion variable. It was reasoned that it would be this latter set of predictors which, if these could be isolated, potentially could be called trace elements.

FINDINGS

Tables 3, 4, and 5 are summary tables for the stepwise multiple regressions performed. Criterion variables are specified as CRC, CJCP, and MRC, respectively. The summary tables list the test factors in the order of their predictive value. The increased correlation at each step is reported along with corresponding variance indices (R^2) and size of the variance change at each step (R^2 Change). Simple correlations are listed again in these tables, for convenience, with the Beta index provided as a measure of the size and direction of the effect of individual test factors at each step.

Criterion Variable: Conventional Reading Comprehension (CRC)

Fifty-eight percent of the variance explaining CRC was found in the ALARM battery, as shown in Table 4, while 47% of this was explained by the test factor called Abstract Verbal Reasoning (AbstVR).

Critical judgment of the "usefulness" of certain statements of information (CJUI) constituted approximately 5% of the remaining variance in CRC. Ability to handle increasing Syntactic Complexity (SynCpx) accounted for an additional 2% of the variance, while Cultural and Experiential compatibility with school (CEComp), Vocabulary (Vocab), Elaborative Thinking (ELBThg), and Critical Judgments-Reasonability (CJR) accounted for the remaining 4% of the variance.

Criterion Variable: Critical Judgments-Continuous Prose (CJCP)

Seventy percent of the variance of the key factor under study, Mature Reading Comprehension (MRC), could be predicted from 8 of the ALARM test factors. Table 5 indicates that 42% of the variance in MRC could be predicted from Abstract Verbal Reasoning (AbstVR); 10% from evaluation of the reasonability of information (CJR); 8% from evaluation of the usefulness of information (CJUI); 3% from cultural and experiential compatibility with the expectations of school (CEComp); 2% from Elaborative Thinking (ElbThg); 2% from General Knowledge (GenKnl), and 1% each from Syntactic Complexity (SynCpx) and Word Recognition (WrdRec).

The first three best predictors, AbstVR, CJR, and CJUI had high simple correlations with MRC: .65, .49, and .64. The simple correlations of MRC and CEComp, the next best predictor, was markedly lower, at .24, but still statistically significant. The next best predictor, ElbThg, had a simple correlation with MRC of only .08, which was not statistically significant. The last 3 predictors each had a moderate to strong, and significant correlation with MRC: GenKnl, .29; SynCpx, .57; WrdRec, .25.

The first three predictors, AbstVR, CJUI, and SynCpx, had high and statistically significant simple correlations with CRC (.69, .59, and .58). The remaining predictors showed either strong, medium, or no significant correlation with CRC: CEComp, .22; Vocab, .45; ElbThg, —.03; and CJR, .14.

Criterion variable: Critical Judgments-Continuous Prose (CJCP)

Sixty-two percent of the variance in the Critical Judgments-Continuous Prose test factor (CJCP) could be predicted from 8 of the 14 other ALARM test factors, as shown in Table 5. 50% of this variance could be predicted from the two other tests of critical judgments: 31% from Critical Judgments-Useful Information (CJUI), and an additional 19% from Critical Judgments-Reasonability (CJR). These two test factors had high simple correlations with CJCP (.56 and .54).

The three next best predictors of CJCP each accounted for approximately 3% of its remaining variance. These were Abstract Verbal Reasoning (AbstVR), Cultural/Experiential Compatibility (CEComp), and Elaborative Thinking (ElbThg). AbstVR had a high simple correlation with CJUI (.53), while CEComp and ElbThg each had relatively low simple correlations with CJUI (.20 and .11).

The remaining 4% of the variance accounted for was associated with General Knowledge (GenKnl), Word Recognition (WrdRec) and Syntactic Complexity (SynCpx). These predictors showed either strong, or no significant, correlation with CJCP: GenKnl, .30; WrdRec, .17; and SynCpx, .47.

RESULTS

The principle elements in Mature Reading Comprehension, as revealed in junior high school students, were Abstract Verbal Reasoning (AbstVR), Critical Judgments-Reasonability (CJR), and Critical Judgments-Useful Information (CJUI). Abstract Verbal Reasoning also was the single best predictor, or principle element, of Conventional Reading Comprehension, followed by CJUI. The principle elements in Critical Judgments-Continuous Prose were the other critical judgments test factors, CJUI and CJR.

The trace elements revealed in Mature Reading Comprehension were: Cultural/Experiential Compatability (CEComp), Elaborative Thinking (ElbThg), General Knowledge (GenKnl), Syntactic Complexity (SynCpx), and Word Recognition (WrdRec). Each of these elements also had some discrete predictive power, at low levels (.03-.01%), for Conventional Reading Comprehension (CRC) and for Critical Judgments-Continuous Prose (CJCP). The levels of contribution of these trace elements changed places in slight, though potentially significant ways. Most noteably, SynCpx was the third best predictor in CRC, the eighth in CJCP, and the seventh in MRC.

DISCUSSION AND CONCLUSIONS

Abstract Verbal Reasoning was the best predictor of both Mature Reading Comprehension and Conventional Reading Comprehension. This basic thinking factor appears to be a form of thinking which is compatible with, though in significant ways distinct from critical-evaluative thinking. One form or another of the three critical judgments tests of evaluative thinking emerged as a principle element in MRC, and CRC.

This critical-evaluative-thinking factor in comprehension appears to be a form of awareness of the undergirth of factors, or precepts, which tend to govern much of what is written and thought. It appears to resemble strongly the Comprehension Subtest of the Wechsler Intelligence Scales for children and adults which is said to measure practical judgments, social acculturation, and maturing conscience or moral sense (Glasser & Zimmerman, 1967).

From a purely logical point of view, reading comprehension seems to make more sense when conceptualized, assessed and taught as a compound factor such as was represented by the addition of Critical Judgments factors to CRC. Most any educator, for example, could have written the following: "The pupil must constantly read to evaluate. The good comprehender is a critical reader. He checks the truth, logic, reliability, and accuracy of what is written . . . He relates the material to his experience. He distinguishes fact from fiction . . ." (Dechant, 1965). In short, when an educator refers to comprehension, the reference is to the breadth of it. It should not be necessary to qualify it by calling it Mature Reading Comprehension, the qualification more appropriately might be reserved for reference to anything less than this.

Cultural/Experiential Compatibility, Elaborative Thinking, and General Knowledge were, upon reflection, concluded to be the *important* trace elements in progress toward mature reading comprehension for junior high students. The reasoning behind this selection fell into two categories. (1) The presence of the CEComp and General Knowledge factors was a re-affirmation of several prior sociological, psychological, and educational studies which say that there is a fund of experiences and facts which sometimes appear to be non-critical in a given situation, though which become major predictors over the long term of academic, social, and reading-language development; e.g., magazines received in the home, and knowledge of seemingly trivial facts and allusions. And (2) the discovery of the trace element Elaborative Thinking seemed a new and pregnant disclosure, with a certain logic to support its potential long term value as well: while divergent thinking might cause an individual to digress from the strict letter of the printed page, it could be argued that this is the sort of thinking which leads to the forming of ideas, sound judgments, heightened curiosity, and unwitting commitment to continual, or life-long, learning . . . assuming of course that there is an adequate level of comprehension and that the digressions do not constitute a chronic form of emotional disruption.

The isolation of these trace elements in Mature Reading Comprehension serves, at this point, as a benchmark in the study of reading maturity. There has been a certain degree of circularity in this extraction of elements which were entered into a battery of tests with a preformed rationale. Even so, these results still are perhaps less redundant than those drawn solely from analyses of a simple recognition-recall test. They have provided support from the proposed analog of trace elements, which may prove to have profound implications for in-depth reading diagnosis and selection of reading methodologies.

It is interesting, as a supportive aside, that Modified Cloze, a traditionally high correlary of conventional comprehension, was a relatively inconsequential factor in prediction of Mature Reading Comprehension. This is not surprising, since it has been established previously that cloze performance is not a significant factor in the comprehension of meaning (Godfrey Culver, et al., 1972), but more so is a measure of awareness of language redundancy patterns (Weaver and Kingston, 1963), a factor which probably has a clear optimal value, and, therefore, a period when it probably is best taught, thereafter being useful for quick measurement purposes, but non-productive as an instructional intervention strategy.

The use of cloze for the measurement of CRC was justified solely upon its high correlations with CRC. Cloze did not correlate well with more profound measures of meaning and other related reading factors; it also proved to be of little value in the improvement of reading comprehension (Martin, 1967). Critical Judgments Continuous Prose (CJCP), however, is highly correlated with CRC (.68), and MRC (.96), as well as with other significant reading factors. On this basis, it appears as if CJCP might be as appropriate for measurement, and more promising as an intervention strategy, for general reading comprehension.

It appears, in conclusion, that one major obstacle to the more profound understanding of reading comprehension has been a certain timidity in stating what it is which needs to be combined to represent the construct more properly. The tendency has been to overvalue factors which correlate highly with conventional reading comprehension and to undervalue or dismiss those which do not. Other, more logically based, methods seem to be necessary as well. In short, the study and understanding of reading comprehension probably will progress better if we select task(s) to represent it which are more sympathetic to the complexities of the process.

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CURRENT RESEARCH AND ANALYSIS OF DEFINITIONS OF COMPREHENSION

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The subject of comprehension is one which is generating considerable attention in the field of reading. The first annual meeting of the American Reading Conference was devoted entirely to the consideration of comprehension, both process and product; the Center for the Study of Reading at the University of Illinois has produced a large body of literature centered around the study of comprehension; and, the *Annual Summary of Investigations Relating to Reading* (1980) reports numerous studies conducted by individuals on various aspects of comprehension.

In her report of a recent observational study, Durkin (1979) began by commenting on her inability to locate an adequate definition of comprehension instruction. Because of this lack of a definition, she constructed one upon which she based her research. Based on her definition, Durkin concluded that: 1. practically no comprehension instruction was done in classrooms and that comprehension assessment was the predominant activity; 2. that teachers neglected comprehension because they were too busy teaching phonics, structural analysis, or word meanings, and; 3. that teachers were assignment givers and checkers.

Hodges (1980) has taken issue with Durkin's definition of comprehension instruction as well as with the way she operationalizes it for categorizing teacher behavior. Hodges agrees that the definition should be limited, but states that it must be broader than that created by Durkin (1979).

Operational definitions of comprehension instruction are based on theoretical definitions of reading comprehension. A variety of theoretical definitions exist that represent diverse schools of thought. The purpose of this study was to determine whether a particular definition or definitions of reading comprehension were widely held by teachers at the elementary and secondary school levels. Additional research, to be reported later, will examine the correlation between teachers' stated beliefs about reading comprehension and their observed teaching practices.

PROCEDURES

Subjects

The subjects for this study were 101 elementary school teachers (grades 1-5) and 46 secondary school teachers (6-12). These teachers were employed in schools that can be categorized as rural, suburban, urban and inner-city.

Instrument

The questionnaire utilized in the study consisted of eight definitions of reading comprehension. Each definition represented a specific and identifiable school of thought. These eight definitions were randomly ordered on the questionnaire and brief instructions were given asking for a ranking with one representing the definition with which there was most agreement and eight representing the definition with which there was least agreement. The author and school of thought were not included.

Definitions and the schools of thought they represent are:

1. Kenneth Goodman—psycholinguistic model. Reading comprehension is a selective process. It involves interaction between language and thought that uses the most productive cues to produce guesses which are right the first time. (Singer & Ruddell, 1970)
2. Wayne Otto—skills approach model. Reading comprehension consists of separately distinguishable comprehension skills which can be taught in the classroom. (Otto, 1977)
3. M. C. Wittrock—generative model. Reading comprehension is when the reader generates from memory one or more representations of an event consistent with the words of the sentence. (Wittrock, 1975)
4. Phillip Gough—information processing model. Reading comprehension is a precise processing of information. It involves exact, detailed, sequential perception and identification of letters, words, spelling patterns, and large language units. (Singer & Ruddell, 1970)
5. George Miller—chunking model. Reading comprehension consists of analyzing small semantic units into larger semantic units instead of vice-versa. (Singer & Ruddell, 1970)
6. Jack Holmes—substrata factor model. Reading comprehension is a reasoning process in which various thinking skills interact in a hierachical pattern. (Singer and Ruddell, 1970)
7. Russell Stauffer—intellectual functions model. Reading comprehension is an intellectual process much akin to thinking and therefore represents a way of making predications based on evidence presented. (Singer and Rudell, 1970)
8. Robert Ruddell—communication model. Reading comprehension is the same as language comprehension. (Singer & Ruddell, 1970)

METHOD

Questionnaires were distributed to members of six graduate reading classes at North Texas State University. These teachers were asked to complete the questionnaire and to have additional teachers in their schools complete the questionnaire. The questionnaire was also distributed randomly throughout one local metroplex school district. One hundred forty-seven usable questionnaires were returned.

The definitions were then rank ordered and percentages of responses calculated.

RESULTS

Responses of the 101 elementary teachers were tallied. Perusal of Table 1 reveals that there was only one definition (#5) that received no first place ranking. Definition #8 received the greatest number of "least agreement" rankings. The results were widely distributed across rankings and definitions.

Table 1

Rank Order Tally of Definitions by Elementary Teachers

Rank	Definitions							
	1	2	3	4	5	6	7	8
1	5	3	18	23	0	28	21	3
2	11	5	13	9	3	23	29	8
3	18	5	15	14	8	19	18	4
4	17	12	24	10	9	10	12	7
5	16	23	10	11	16	8	9	8
6	12	18	10	13	23	7	5	13
7	9	15	5	12	30	5	5	20
8	13	20	6	9	12	1	2	38

n = 101

Responses of the 46 secondary teachers were tallied. Perusal of Table 2 reveals that there were two definitions (#2 and #5) that received no first place rankings. Definition #5 also received no second place rankings. Definition #8 received the greatest number of "least agreement" rankings. Definition #7 received no "least agreement" rankings. The results were widely distributed across rankings and definitions.

Table 2

Rank Order Tally of Definitions by Secondary Teachers

Rank	Definitions							
	1	2	3	4	5	6	7	8
1	7	0	4	4	0	13	16	2
2	10	1	5	5	0	8	16	1
3	7	3	8	8	4	8	5	3
4	8	2	13	7	3	5	4	4
5	6	9	5	6	13	5	1	1
6	2	10	4	7	10	3	2	8
7	4	13	4	1	12	2	2	8
8	2	8	3	8	4	2	0	19

n = 46

Responses of the 147 teachers were jointly tallied. Perusal of Table 3 reveals that there was one definition (#5) that received no first place ranking. Definition #8 received the greatest number of "least agreement" rankings. The results were widely distributed across rankings and definitions.

Table 3

Rank Order Tally of Definitions of All Teachers

Rank	Definitions							
	1	2	3	4	5	6	7	8
1	12	3	22	27	0	41	37	5
2	21	6	18	14	3	31	45	9
3	25	8	23	22	12	27	23	7
4	25	14	37	17	12	15	16	11
5	22	32	25	17	29	13	10	9
6	14	28	14	20	33	10	7	21
7	13	28	9	13	42	7	7	28
8	15	28	9	17	16	3	2	57

n = 147

Rank orders and percentages of definitions were determined for specific categories within the sample.

The responses of elementary teachers were rank ordered by first choice; first and second choice combined; and first through fourth choices combined. Definition #6 ranked first in all three categories. Definition #4 ranked second in total ranking, while definition #7 ranked second in the combination of choices. Definition #5 ranked last in all three categories.

The responses of elementary teachers were rank ordered by first choice; first and second choice combined; and first through fourth choices combined. Definition #6 ranked first in all three categories. Definition #4 ranked second in total ranking, while definition #7 ranked second in the combination of choices. Definition #5 ranked last in all three categories.

The responses of secondary teachers were rank ordered by first choice; first and second choice combined; and first through fourth choices combined. Definition #7 ranked first in all three categories. Definition #6 ranked second in all three categories. Definition #5 ranked last in all three categories.

The responses of all teachers were rank ordered by first choice; first and second choice combined and first through fourth choices combined. Definition #6 ranked first in total ranking. Definition #7 ranked first in both combination rankings. Definition #7 ranked second in total ranking while definition #6 ranked second in both combined rankings. Definition #5 ranked last in all three categories.

Definitions #6 and #7 were ranked first or second in eight of the nine categories. Definitions #2 and #8 were ranked sixth or seventh in all nine categories. Definition #5 was ranked eighth (last) in all nine categories.

Definition #6 was ranked first by 28% of the elementary teachers, 28% of the secondary teachers, and 28% of all teachers. Definition #6 was a first or second choice of 51% of the elementary teachers, 46% of the secondary teachers, and 49% of all teachers. Definition #6 was one of the first four choices of 80% of the elementary teachers, 74% of the secondary teachers, and 78% of all teachers.

Definition #7 was ranked first by 20% of the elementary teachers, 35% of the secondary teachers, and 25% of all teachers. Definition #7 was a first or second choice of 50% of the elementary teachers, 70% of the secondary teachers, and 56% of all teachers. Definition #7 was one of the first four choices of 80% of the elementary teachers, 89% of the secondary teachers and 82% of all teachers.

There is a distinct and discernible pattern of stated preference for definitions of reading comprehension. This pattern is supported by both rank order choices and percentage of teachers choosing each definition. This pattern holds constant across all nine categories.

DISCUSSION

It is obvious that patterns of stated preferences for theoretical definitions of reading comprehension exist. These patterns are similar for elementary and secondary teachers, and so would seem to be representative of teachers in general.

The most often chosen two definitions represent Stauffer's intellectual functions model and Holmes' substrata factor model. These definitions are similar in that they equate or compare reading to an intellectual or reasoning process much akin to thinking. If one's operational definition were to follow from one's theoretical definition, it would seem that the majority of teachers would be conducting their reading classrooms in a thinking mode with a high priority placed on prediction.

The least chosen two definitions represent Miller's chunking model and Otto's skills approach model. These definitions are also similar in that they seem to represent an isolated skills approach to reading comprehension. If one's operational definition were to follow from one's theoretical definition, it would seem that the majority of teachers would avoid isolated skills as well as the process of working with small parts of language rather than ideas.

The pertinent question seems to be whether, in fact, one's operational definition derives from one's theoretical definition. Research (Durkin, 1979; Kurth & Greenlaw, 1980) seems to disprove this. Durkin reported that an unusual amount of time was devoted to assignment giving and checking and little time to development of comprehension. This behavior would not seem to represent a belief in definitions #6 or #7. Kurth and Greenlaw reported that the majority of time (35%) in formal reading instruction was spent on phonics and structural analysis skills. This was true as an average percentage of grades, K, 2, 4, and 6. Very little discussion or interaction from child to child occurred in the classes that were observed. This behavior does not seem to represent a belief in a thinking, intellectual mode of reading instruction.

Why are teachers behaving in a manner that seems to reflect the philosophies they rank as least agreeable? One reason might be that, though teachers want to think of themselves as developing thinking skills, this method requires constant attention, flexibility and planning. Each group and individuals within the group will respond differently, and time is a necessary ingredient. It is much easier and faster to whip through a set pattern determined by the editors of a basal program. Being human, teachers have lofty ideals, but fall prey to the daily grind.

A second possibility is that, though teachers believe in teaching thinking skills, the majority of reading achievement and competency tests seem to test isolated skills. A concern for test-taking appears to rule teaching behavior.

Whatever the cause for this bi-polar behavior, it would seem reasonable to suggest that teachers closely inspect their stated beliefs in reading comprehension, determine schemes for implementing their beliefs, and teach in a manner that is consistent with their beliefs.

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RESEARCH AND PRACTICES IN COMPREHENSION INSTRUCTION IN ELEMENTARY CLASSROOMS

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The purpose of this observational study was to describe the comprehension instruction which occurs during formal reading classes in elementary schools. Previous research investigating classroom comprehension instruction has generated a concern about the quality and quantity of such instruction. After conducting an extensive observational study, Durkin (1979) reported that: a. practically no comprehension instruction was done in classrooms and that comprehension assessment was the predominant activity; b. that teachers neglected comprehension because they were too busy teaching phonics, structural analysis or word meanings, and; c. that teachers were assignment givers and checkers.

Hodges (1980), however, has questioned both Durkin's definition of comprehension and the way in which she operationalized it in her scheme for categorizing teaching behavior. The present investigation was designed to provide more direct observational data about reading instruction in order to determine the validity of Durkin's findings.

The research design used in this study differed from that used by Durkin in two major respects. First, because Durkin's definition of comprehension was generally criticized as too narrow and confining, the definition of comprehension instruction was broadened. Also, teachers from four grade levels in elementary schools were observed rather than having observations from only one grade level as Durkin did.

PROCEDURE

Subjects

The subjects for this study were 16 certified elementary classroom teachers, 4 each from grades kindergarten, 2, 4, and 6. Each of the teachers was chosen randomly from a pool of all grade level teachers in a suburban school district in Texas. Each teacher randomly selected was asked to participate in the study. It had been planned that if a teacher refused to participate, an alternate would be chosen. However, all of the first 16 teachers selected agreed to participate in the study.

Observation Schedule

Each of the 16 teachers was observed during three 60 minute periods during the regularly scheduled reading classes. Because reading classes were longer than an hour, the observation times were scheduled to sample each section of the reading periods. The observations were made on three successive school days, with almost all of the observations done on either a Monday, Tuesday, Wednesday, or a Tuesday, Wednesday, Thursday cycle. A total of 48 hours of observation time was included in the study.

The observations were made by two university faculty members and two doctoral students in reading education. The use of four observers made it possible to have each teacher observed by three different researchers. All observations were made between October 20, 1980 and November 14, 1980.

Observation Instrumentation

The observation instrument used in this study was a modification of that used by Durkin in her 1979 study. Because the researchers felt that the comprehension instruction category defined by Durkin as "the teacher does something to help one or more children understand more than a single word" was too vague, nine specific categories include:

1. Comprehension instruction/assignment checks—Teacher says or does something to help one or more students understand more than a single word by directing an activity in which he/she checks a class or homework assignment by explaining wrong answers, expanding on correct answers, questioning, discussing the assignment.
2. Comprehension instruction/application—Teacher says or does something to help one or more students understand more than a single word by directing an activity which provides practice of concepts previously taught. (Ex. questioning, discussion.)
3. Comprehension instruction/helps with assignment—Teacher says or does something to help one or more students understand more than a single word by assisting one or more students with an assignment that focuses on comprehension of connected text. (Ex. asking questions, suggesting that parts be reread, asking for paraphrases.)
4. Comprehension instruction/prediction—Teacher says or does something to help one or more students understand more than a single word by directing one or more students to predict outcomes in text or verbal discourse.
5. Comprehension instruction/preparation—Teacher says or does something to help one or more students understand more than a single word by preparing one or more students to read text through directing attention to vocabulary, eliciting children's experiences, or attempting to motivate the children.
6. Comprehension instruction/strategies—Teacher says or does something to help a student understand more than a single word by giving specific information on how to identify a main idea, find a topic sentence, skim a paragraph, locate information, etc.
7. Comprehension instruction/review—Teacher says or does something to help one or more students understand more than a single word by reviewing or repeating earlier instruction.
8. Comprehension Assessment—Teacher asks questions to determine comprehension of connected text.
9. Comprehension/gives assignment—Teacher gives an assignment which will require students to understand connected text.

The other categories included in the observation instrument were the same as those used by Durkin. The general categories used included phonics and structural analysis, silent reading, oral reading, teacher reads aloud, transitional activities, and non-instructional activities.

The observational focus was the specific teacher behavior during reading instruction. The observed behavior was coded by the observer and the recordings were made in terms of real time by seconds. This procedure made it possible to analyze total time spent on specific activities and to determine percentages of instructional time devoted to specific teaching activities.

Observer Training

All four observers had participated in the rewriting of the observation instrument. Therefore, each observer was already very familiar with the coding system used on the instrument. However, in order to ensure observer consistency in coding behaviors, twenty hours of training time were spent observing video tapes and actual classroom reading lessons. After the observations were completed, observers' codings were compared and discussed until uniformity of coding was achieved.

RESULTS

After the observations were completed, a summary sheet which listed the amount of time spent in each of the various instructional activities was compiled for each subject. The percentage of total reading classtime spent in each activity was also calculated. The summary sheets for each teacher were then compiled into summary sheets for each grade level. The specific observation reports were also studied in order to determine specific patterns of teaching activity.

The analysis of the summary sheets compiled from all of the grade level reports showed that an average of 32% of the instructional time during the formal reading instruction was spent in some form of comprehension instruction; 35% of the instructional time was spent in teaching phonic and structural analysis; 8% of the time was spent in silent reading; 4% of the time was spent in oral reading; 2% of the time the teacher read to the children; and 19% of the time was spent in transitional and non-instructional activities.

When the results were analyzed by grade level, it was found that in sixth grade 49% of the instructional time was spent in comprehension activities; 18% of the time was spent in phonics and structural analysis; 12% of the time was spent in silent reading; 2% of the time was spent in oral reading; and 19% of the time was spent in non-instructional activities.

At the fourth grade level, 44% of the instructional time was spent in comprehension activities; 20% of the time was spent in phonics and structural analysis; 9% of the time was spent in silent reading, 3% of the time was spent in oral reading; and 24% of the time was spent in non-instructional activities.

At the second grade level, 31% of the instructional time was spent in comprehension activities; 32% of the time was spent in phonics and structural analysis; 11% of the time was spent in silent reading; 13% of the time was spent in oral reading; and 13% of the time was spent in non-instructional activities.

At the kindergarten level, 3% of the instructional time was spent in comprehension activities; 68% of the time was spent in phonics and structural analysis; the teacher read aloud 9% of the time; and 20% of the time was spent in non-instructional activities.

Because the major focus of the study was comprehension instruction, an analysis was also made of the specific types of comprehension instruction used by teachers. The results of the comprehension analysis showed that teachers spent 919 of the 2,880 minutes teaching comprehension.

The comprehension categories coded in the study were Comprehension Assessment, Comprehension Assignment, Comprehension Application, Comprehension Aid on Assignment, Comprehension Review, Comprehension Prediction, Comprehension Preparation, Comprehension Strategies, and Comprehension Assignment Check.

Of the 919 minutes of comprehension teaching, 186 minutes of instruction were classified as Comprehension Assessment; 179 minutes were classified as Comprehension Application;

134 minutes were classifed as Comprehension Assignment Check; 108 minutes were classified as Comprehension Aid on Assignment; 104 minutes were classified as Comprehension Strategies; 70 minutes were classified as Comprehension Assignment; 65 minutes were classified as Comprehension Preparation; 51 minutes were classified as Comprehension Review; and 22 minutes were classified as Comprehension Prediction.

The percentage of total comprehension instruction time for each comprehension category was also calculated. The largest percentage of teaching time was devoted to Comprehension Assessment (20%). Comprehension Application was taught 19% of the time; Comprehension Assignments were checked during 15% of the time; Comprehension Aid on Assignments was given 12% of the time; Comprehension Strategies were taught 11% of the time; Comprehension Assignments were given during 8% of the time; Comprehension Preparation was done 7% of the time; Comprehension Review was done 6% of the time; and Comprehension Prediction was taught 2% of the time.

DISCUSSION

The first major finding of this study was that teachers spend an average of 32% of formal reading instruction classtime teaching comprehension. Also, the amount of comprehension instruction increases substantially as the grade level increases. However, the extremely small percentage of comprehension instruction at the kindergarten level is a cause for concern. Even though kindergarten teachers in the study cited comprehension as an important part of the reading process, they did not implement this belief into the formal reading instruction. It would seem difficult for beginning readers to understand that the purpose of reading is to obtain meaning unless meaning is stressed by their teachers as they begin learning to read.

While 32% of the formal instruction was comprehension oriented, the majority of the time was spent on phonics and structural analysis skills. Even in 6th grade, when the bulk of these skills are already learned, teachers spent 18% of the classtime on phonic and structural analysis skills, and the average percentage of time spent on these skills was 35%. Thus, the results of this study agree with the finding of Durkin that teachers are very busy teaching phonetic analysis.

The study also showed that silent reading is done by children only about 8% of the time in formal reading instruction. If children do not read outside of the reading group, they have very little opportunity to practice reading to attain the automatic levels required by mature reading. It would seem logical that in the reading period some provision would be made to provide substantial amounts of practice in the skill of silent reading.

Another major finding of this study is that teachers feel most comfortable when teaching comprehension through assessment. Of the specific comprehension categories coded in the study, comprehension assessment, followed closely by comprehension application, was the major category taught. On the teacher questionnaire, teachers felt very strongly that assessment was a particularly effective method for teaching comprehension, and their classroom practices evidenced this belief. Also, the assessment was primarily teacher directed.

A distinct difference could be seen in the approach used by teachers when teaching comprehension skills as compared to the approach used when teaching word recognition skills. In most instances, when a teacher was focusing on a phonetic skill, a period of direct instruction was used during which time the teacher explained specific strategies for the particular phonetic skill being taught. Then an assignment was given and the children proceeded with the task. Thus these lessons were coded as phonics strategy followed by phonics assignment followed by phonics application. However, during comprehension instruction, teachers rarely used comprehension strategies instruction; the most often coded pattern was comprehension assignment followed by comprehension application.

This finding of the study that teachers do not use direct instruction in comprehension strategy is substantially the same finding as Durkin reported and classified as "mentioning". When faced with teaching a comprehension task, teachers generally "mentioned the skill" which they wanted the children to learn with a cursory overview such as, "We're going to read these exercises to try and find some main ideas." Then children were asked to do the task immediately with no further instruction. Then as children did the assigned task, the teacher helped those students having difficulty with specific items on a one-to-one basis.

This typical lesson pattern was the probable cause for another major finding of the study that most comprehension instruction is done on a one-to-one basis. Teachers were more apt to discuss comprehension strategies with individual children having difficulty with specific items than to discuss comprehension strategies in whole group settings. This tendency also led to highly inflated comprehension percentages. For example, in one typical lesson a teacher was coded as spending 36 minutes in teaching comprehension application, but these 36 minutes were spent in discussions with 12 individual children, so that each child received an average of approximately 3 minutes of instruction.

In summary, when teachers teach comprehension they use two primary methods, one being the use of comprehension assessment after portions of text are read, and second, the use of discussions with individual pupils.

All of the reading classes observed, from kindergarten through sixth grade, used homogeneous grouping by ability for the reading instruction. All classrooms were divided into three reading groups. However, even though the classes were divided by ability levels, in most instances, the teacher taught the same lesson to each group with no modification in either content or methodology for the particular group. (In fact, one student who reported to his teacher that he knew the correct answer to a workbook question because he had listened in on the first group was chastised for listening to someone else's instruction.) Thus, it must be concluded that teachers do not use grouping to modify lessons for the levels within the group—rather it appears to be a procedure of habit.

The widespread use of grouping also seems to affect reading instruction in another way. All of the classes observed used a substantial portion of the classtime for transitional activities. The typical 60 minute observation found teachers using an average of 19% of this time for transitional and non-instructional activities. These relatively high amounts may have occurred because of the need to move three groups of children around the room each period. If grouping is not going to be used to improve individual instruction, it may only serve to use up valuable instructional time. The 19% figure for non-instructional activities points up clearly the need for effective pre-service and in-service training in classroom management skills. There was a great deal of variance from teacher to teacher in this category, thus pointing out that individual patterns of classroom management do affect the quality of instruction

An incidental finding of the study concerned the teacher's stated objectives for lessons. For the most part, the objectives stated for the comprehension sections of the lessons were very vague. In many instances the teachers reported that the aim of their lesson was to "read the story in 'Rainbows' and do the workbook." Teachers were much more apt to have specific objectives when teaching specific phonics, structural, or word meaning objectives. It may be that, as Lanier and Floden (1979) report, teachers need help in having research knowledge translated into articulate sets of curricula. This need appears to be especially great in the area of reading comprehension.

Because of the broad definition of comprehension used in this study, the percentage of time reported as spent in comprehension instruction was significantly greater than that reported by Durkin. However, many of the instructional patterns reported by Durkin were evident in the classrooms observed in this study, and her major conclusion that very little direct instruction of comprehension is being done in elementary classrooms is substantiated by this study.

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ACTIVE READING BEHAVIORS: A PRODUCT CENTERED APPROACH TO COMPREHENSION

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What is an active reading behavior you might ask? Is this a new term for some old reading concept or is this a new approach for teaching reading at the secondary level? We feel it is a synthesis of the old and new. Active reading behaviors result in desired products of reading and reading related activities. For example, we look at "identifying an unknown word" as an active reading behavior. Davis (1968) in his factor analytic studies found that knowledge of vocabulary is one of the two most important factors in reading and understanding written materials. Our explanation of identifying unknown words involves having the students actively tag and work with unknown vocabulary words when they encounter them. We do not focus on teaching a series of skills such as syllabication, roots, affixes, and so forth, hoping that these skills will transfer when the student encounters new or difficult vocabulary. Rather we focus upon those products of reading that teachers will accept as evidence that the material is being read and students are gaining meaning from the material. This follows Goodman's model of reading that looks at meaning as the end product of the reading process.

What Approaches Do We Question or Reject

We reject the notion of teaching students a series of isolated reading skills for the following reasons. Lists of reading skills may range from a few broad categories to hundreds of specific and detailed items. Lennon (1960) summarized approximatly 30 studies and categorized all of the skills which were found in these studies into four essential components:

1. A verbal factor which is closely related to the knowledge of the vocabulary
2. Understanding literal meaning and the ability to follow directions
3. The ability to infer latent meanings and to predict outcomes
4. An appreciation of reading (for example, being able to see the purpose, judge tone, etc. . .)

Other lists, such as one by Herber (1970), may name 100 or more components of the reading process. Nearly every reading educator has a list of reading skills and each is different. The reason is obvious—skills overlap, and it is sometimes impossible to confine a skill to a single category. For example, taking notes may be defined as a study skill; yet a student cannot take good notes unless he/she can first ferret out the main ideas; and is not finding the main idea a comprehension skill? Palmer (1975) sees as a pitfall for the content area teacher the "tendency to teach reading as if this highly complex mental activity is little more than a bag of devices." When a student reads for meaning, he may read for many purposes at once, so that reading comprehension must involve more than just the systematic progression through sequential and cumulative levels.

We strongly question the notion of the reading teacher and content area teacher sitting down and trying to identify a set of specific skills that are requisite for mastering specific subject area materials. This procedure, even if it has face validity, has two serious drawbacks: (1) such a list of skills leads teachers to believe that skill-related activities can teach students to read the assignment; and (2) there is seldom an observable correlation between acquisition of such skills and improved reading in the content area.

Turning To Active Reading Behaviors

The active reading behavior approach is an alternative to the two approaches we have just described. This approach focuses on the products of reading, not skills to be mastered prior to reading. For example, a social studies teacher may want students to summarize two different editorials. By focusing on what outcome the teacher wants, strategies can be developed and employed to assist students while going through the editorials to arrive at the point where they can effectively summarize.

We feel this approach is different in several ways. First, this approach looks for observable proof of reading comprehension that is acceptable to the content area teacher. Second, active reading behaviors offer better indicators of student's knowledge of the material than end of unit examinations or standardized tests. Third, the product of an active reading behavior is something the content area teacher can teach a student to produce; and fourth, students who practice active reading use other language skills of listening, writing, and speaking and thus the student integrates a full language repertoire as meaning is made during the reading process.

In addition, this approach allows teachers to be more specific about what they need to do in order to help students with reading the material. For example, rather than teachers stating, "Oh, my kids cannot read," they might begin to say or admit that their students cannot "paraphrase" very well or "ask pertinent questions" about a reading selection. These products of active reading would appear to be more manageable and remove some of the mysticism from the teaching of reading in the content areas.

WHY IS THERE A NEED FOR A DIFFERENT APPROACH

We are seeing a heightened awareness among content area teachers of the importance of reading. More importantly, this awareness includes a recognition of the content areas as a place for learning to read content material. More and more teachers are accepting a responsibility for providing activities which will maximize each student's *potential* for comprehending a reading assignment. However, this is a responsibility for which many teachers feel they are inadequately prepared. The following problems are of special concern.

Differences Between Students

The reading abilities of students in any given content classroom may vary from extensive to non-extant, and a teacher knows that a reading assignment is meaningless for a student who cannot gain meaning from it. The alternatives for the teacher are: (1) to use other media, such as lecture and films; or (2) to teach the student to read. Without adequate preparation, the teacher must opt for the former. Background experiences in the subject may also vary considerably; new learning is built upon old, and we cannot assume that every student who comes into a class has previous knowledge and/or skills upon which new learnings can be based. For those who do not, a reading assignment can be an exercise in futility.

The Problem of Transfer

Reading and study skills may be carefully taught in the reading class but they are not automatically transferred from the laboratory or clinic to the situation where they are to be used. As Richard Castillo (1976) said,

> A simulated lesson on how to take notes in English class is likely to produce students who are very competent at taking notes in simulated environments.

The problem is one which concerns nearly every reading educator. In *Everybody Into The Pool,* Howard Miller (1975) states,

> The skills they (students) learn in reading class never leave the room, and the students remain lost and confused in handling printed material of other subject. . .There is a need, then, to convince the content area teacher that there are methods and materials which make the teaching of reading an integral part, rather than a separate function, of the content work.

From Narrative to Expository

Even for students who read well a text in a particular subject area may require some specialized knowledge of skills for which they are not prepared. At the primary level, teaching of reading is often limited initially to decoding skills. The reading material used is narrative in style, and the vocabulary is non-technical. As these students move into the intermediate and secondary grades, they are faced with expository writing style, content specific vocabulary and a wealth of new concepts. The change from "learning to reading (decode)" to "reading to learn" is a tremendous step for these readers, and one for which many are not prepared.

Teachers Are Not Prepared

Content area teachers, when told that "every teacher must be a teacher of reading," are often angry and frustrated. Until now, content area teachers usually have viewed reading as a separate subject having its own set of skills, teaching techniques and terminology which endowed the term "reading" with a special "mystique." "Only reading teachers know how to teach reading," they imagine. Many view this new requirement as an intrusion on their time. Others, familiar with the "swings of the pendulum" in education, wait patiently for the responsibility to go away. Even those who are willing to accept the responsibility for providing reading instruction to their students often are worried. They assume that before they can help students learn to read, they must be trained as reading specialists, an assumption which is bound to make them become apprehensive about the acceptance of this new role.

HOW DID WE SELECT ACTIVE READING BEHAVIORS

Over the years we have had contact with public school secondary content area teachers. We have been one of them; we have worked within their classes; we have provided them with inservice training and we have taught them required undergraduate and graduate courses in secondary reading. Through these years we have also been barraged with competency based education and goal directed training rhetoric. One common cry coming from all these encounters has been teachers claiming, "My kids cannot read."

Early on we danced around this statement by either telling the teachers they were generalizing or making an overstatement. We followed that up with demonstrations that being able to read is relative to what is being read and admonitions such as "your kids can read something, and it is your job to help them read your difficult material."

After a few sessions of these and other "attitude adjustment" activities, we typically moved on to give them more knowledge about the reading process. Then a number of "how to diagnose and prescribe" activities were followed by a series of suggestions on how to teach a few skills.

In short, we taught teachers about secondary reading and never really heard their first cry—"My kids cannot read." As a result, much of our instruction fell on deaf ears. After years of agonzing over our teachers' ineptness, (really our own), we began to ask a measurement question—"How do teachers know their kids can or cannot read?" We knew teachers seldom used standardized tests, and we knew teachers were frequently asked to judge reading performance of students. This lead us to ask, "What do teachers accept as the evidence that kids are reading?" and thus "What do kids as readers need to do?"

This led us to develop a list of answers. Items on the list included the following: ask questions, verify what is there, paraphrase, predict what is, visualize, see relationships; e.g., cause, effect, specific or general,implicit or explicit, relate ideas to the here and now, convert visuals to narrative, exhibit levels of thinking such as analysis and synthesis, determine meaning from context, answer questions, reread, recite, summarize, psyche out writer's style, determine author's purpose and point of view, attend to topographical signals, label propoganda/fact/opinion, vary rate, share meaning, assimilate.

Upon examination of our own cryptic list, we realized it was a mix of traditionally accepted reading skills, poor descriptions of psychological processes that may go on in the minds of readers and some outward behavior that may be evidence of skill attainment or the psychological processes.

At this point we decided to sharpen and expand our list. We expanded it by focusing upon behaviors that suggested the student was working with the material to make meaning (active response as opposed to a passive response). We sharpened it by returning to the question, "What evidence would we and teachers accept that this active reading has taken place or is taking place."

As a result of this process, we identified seven products of active reading behavior. They are: Identifying unknown words, paraphrasing, summarizing, predicting, asking questions, making diagrams, and varying reading rates.

EVIDENCE OF THE ACTIVE READING BEHAVIOR

Below we present an explanation of each of the seven active reading behaviors. Within each explanation we define the behavior, suggest what we believe mature, active readers do as they engage in such behavior, and identify the evidence the teacher can accept that active reading is taking place.

Identifying Unknown Words

Unknown words refer to: (1) outright unknowns (that is, words whose configurations and meanings are not known); (2) words the student has seen in context but to which he or she does not attach meaning; (3) words that the student can use orally but does not attach meaning; (4) words that the student can use orally but does not recognize in print; and (5) misconceived words (those to which the student attaches a wrong meaning, given the context).

Every word in a passage makes some contribution to the meaning of that passage. A reader who is actively reconstructing meaning makes adjustments when confronted with an unfamiliar word or one that does not make sense in the context of the selection. The teacher can make the reader more aware of the importance of stopping to examine these words and can provide practice in doing so. But, ultimately the reader must take the responsibility for recognizing the unfamiliar word or the familiar word that does not fit the context in which it is being used.

In a sense, the identification of unknown words is probably the single most important step in improving reading skills. If a key word remains a mystery to students or if their interpretation of an unknown word is muddled, chances are they will not understand the passage or will misperceive the author's message. The example comes to mind of a politician some years ago who campaigned in a largely illiterate section of our country. He charged his opponent with "practicing monogamy." Those constituents who were stumped by the word monogamy probably thought it was a euphemism for something vice. (The opponent lost the election!) Clearly, all teachers must stress the identification of unknown words so that students may be freed from the tyranny of misconception.

Paraphrasing

We use paraphrase to mean restating a word, phrase, sentence, or portion of a paragraph in one's own words. Paraphrasing is not editing or interpreting or summarizing. When students paraphrase, they should not excise, delete, expand, or emphasize parts of the original text. Rather, they simply restate the original in their own words. They are in effect translating meaning into their own vocabulary and thus their own frame of reference.

The teacher will recognize, however, that paraphrases by their very nature are limited; no written passage of great length can be expeditiously paraphrased, and no lengthy oral passage can be remembered in sufficient detail to permit accurate paraphrase.

The student's ability to paraphrase also signals to the teacher that the student has a literal knowledge of the material and what cognitive structures the student is using as the original text is cast into familiar words and a personal frame of reference. At times this active processing, thinking and playing with the test takes place in the middle of reading a passage—as the reader rereads a phrase or a sentence. At times it happens after reading as the reader reviews what was read. The ability to paraphrase is important because it allows the student to practice a basic communication skill.

Summarizing

Summary is both more and less elastic than paraphrase. A summary, unlike a paraphrase, freely employs the same words and sentences as its source, but varies greatly from the source in amount of detail and length. A summary is more creative than a paraphrase in that it selects essential material, deletes peripheral material, and may rearrange and prioritize material in a manner different from its source.

Summaries may take different forms depending upon their purpose. A summary may be an outline or synopsis, in the same way that a sketch gives the basic outlines of a portrait. One summary might reflect the reader's expectations and the ways in which these expectations are met; another summary might reflect an author's stated goals and the degree to which these are met. The internal organization of a piece of writing might form the basis of one summary; the ramification or extensions of an article or chapter might determine the nature of another kind of summary. Each summary, no matter which form, is evidence that the reader is acting upon or interacting with the meaning inherent in the text.

Summaries can help both student and teacher in a number of ways. Since summaries focus attention on key concepts, they can help a student organize thoughts, promote retention of significant details, provide automatic review of material, and increase motivation—since the "nugget of knowledge" expressed in the summary is a tangible by-product of the studying/summarizing process. Summaries also help students reduce a complex, elaborate text to the level of mnemonic manageability. For teachers, student summaries can be used as clear indices of reading comprehension, as diagnostic devices that give clues to students' reading difficulties, and as preparatory assignments before examinations.

Predicting

To predict means simply to suggest outcomes on the basis of limited information. This information may come either from the student's own experience, a preview of the reading passage, or having read a portion of the text. Obviously, depending upon the amount of information known the prediction will be either more or less apparent, more or less of a "wild guess." Predictions can be appropriate or inappropriate. We believe active readers regularly create reasonably accurate and appropriate projections. Such anticipation results in readers who are reading purposively and reading to verify what they believe to be true.

The challenge of predicting outcomes can lend an element of curiosity and intrigue to the reading matter. Students who are interested enough to make a prediction about what will come later in the text have a personal stake in the material. They are motivated. Predictions also promote intelligent guessing and intuitive thinking. If students can make accurate and appropriate predictions based on an introductory reading passage, the teacher is assured they have probably understood the material. Students who predict at appropriate spots within a passage, display an understanding of the logic or flow of the material.

Asking Questions

Usually we think of questioning in relation to tests, classroom discussions, and exams. In this context, questions are designed to elicit various kinds of information from the student. At their most complex levels, such questions may encourage students to reorganize and interrelate the discrete items of information they have learned. In terms of active reading behavior, questions are formed by the student and guide the student toward learning facts or concepts on various levels of difficulty. In this context the asking of questions by the student is a focusing or guiding activity, not a testing or checking activity.

When students read with some questions already in mind, they are less likely to be distracted and are more likely to focus productively on important aspects of the text. Students who read to answer questions they have formulated for themselves are actively engaged in the reading process. They are conscious of their own purpose of reading and read more critically. When question-asking becomes an automatic and incorporated part of the student's reading behavior, that student reads more effectively and efficiently.

Making Diagrams

Diagrams are defined here as any device by which the student can translate reading material or speaking into a visual pattern. Diagrams, then, may include sketches, drawings, charts, illustrations, outlines, floor plans, maps, timelines, and so on. Students frequently diagram three types of information: (1) chronological (time order); (2) spatial (shows differences from area to area); and (3) expository (organizes information,to show relationships between ideas of facts, such as cause and effect, classification, hierarchy, etc.)

Varying Reading Rate

Active readers change their reading rates to suit the material or the purpose for reading. By watching eye movement, evidence of increasing rate can be observed as the reader skims (getting the most out of a passage), scans (reading to locate specific facts or ideas), and even skips sections of a passage. Behaviors that suggest the reader is slowing down include rereading, reading and reflecting (stopping at the end of a sentence, paragraph, or section to think over what has just been read), notetaking, and underlining.

UNANSWERED QUESTIONS

Have we identified appropriate active reading behaviors? Have we selected the right products for active reading behaviors?

Originally we generated a list of 20 active reading behaviors. The initial list of behaviors was generated on the basis of what, we felt, good readers do when they read. In other words, we considered what students, colleagues, and other good readers do when they read. Almost as soon as we developed the list we began to reconsider the behaviors and started to reduce the number of behaviors on the list.

The reduction process was based in part on redundancy of items and in part on further analysis of what good readers do. You might ask what role, if any, did research play in making our decision to pare down the list. The answer is very little. We were looking for an approach that could have immediate utility for the secondary teacher. Could we have overlooked some important behaviors and could we have identified some products of these behaviors that are inappropriate? The answer to both these questions is yes.

We believe that both reading experts and teachers in the field need to help us in identifying other behaviors that should be included on the list. Also, there is a need for other suitable products of these behaviors to be identified. We are not sure if we have identified the essential products of these behaviors, or if we have missed many obvious products that should have been included.

The answer to these first two questions depends on further probing, questioning, and listening carefully to others involved with teaching reading or teacher training.

Are the active reading behaviors we identified appropriate for one content area but only partially appropriate for other content areas?

The answer to question one will go a long way toward answering this question. If the list of seven active reading behaviors is expanded or modified, then the list will also need to be reexamined in light of the demands of various subject area reading tasks. These demands will probably be closely related to the various types of reading materials that are used in teaching the subjects we find in today's secondary schools.

What questions might teachers, administrators, and parents ask?

There is a host of other related questions that also need to be considered. These questions are:

- Do teachers find this approach useful?
- Do students who exhibit these active reading behaviors correlate with successful readers?
- Are active reading behaviors coachable through the use of glossing?
- Can students be taught these active reading behaviors and if so, does the acquisition of these behaviors improve reading scores?

These four questions along with other practical questions about the utility of the active reading behavior approach could be asked. We feel the key is whether answers to these last four questions should be obtained before even dwelling on questions one and two. Stated another way, these last four questions are the more practical ones and might make it easier to answer the first two which are the more theoretical questions. Finally, the question of how the notion of active reading behavior fits into other theoretical models and processes of reading needs to be examined at some future date.

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A SUMMARY OF STUDIES ASSESSING SECONDARY TEACHERS' ATTITUDES AND PERCEPTIONS OF COMPETENCY IN CONTENT AREA READING INSTRUCTION

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Developing students' reading proficiency in the various content areas is a growing concern among educators. Administrators and teachers are becoming increasingly aware that many students are not able to meet the reading expectations in the secondary school curriculum. Until recently, many educators had considered reading instruction to be solely the responsibility of the elementary schools. Secondary teachers and administrators operated on the assumption that once students were taught the basic reading skills in these first years of school, the development, application, and refinement of these skills would follow naturally with simple usage. These secondary teachers and administrators believed that the general reading skills taught in the elementary school would be adequate for the successful reading and achievement in the various secondary content areas.

This assumption is slowly being discarded. Today, confronted with the growing number of secondary students who are unable to meet the reading requirements in the content classrooms, more educators are realizing that not only improved reading instruction at the elementary level but also continued developmental reading instruction at the secondary level is imperative. These educators have observed that as students progress through the grades, increased proficiency in reading skills is needed in order for students to keep pace with the growing demands of the content area curriculum. Without a parallel development of reading skills, achievement in the subject areas is severely hampered.

In discussing the importance of reading in the subject matter areas, Taschow (1969) emphasized that reading is so integrated and so interrelated with any subject area and therefore with the total educational progress that educational success requires successful reading. Realizing that "both content and concomitant reading skills are essential components of successful subject-matter teaching and learning" (Burron & Claybaugh, 1974, p. 7), most authorities in education are beginning to insist that reading instruction is the responsibility and the job of all teachers in the secondary schools.

Although efforts have been made to establish developmental reading programs at the secondary level, many surveys investigating the state of content area reading instruction have cited a reluctance on the part of secondary teachers to recognize and to accept their responsibility for the teaching of reading skills relevant to their content areas (Bowren, 1970; Fallon & Filgo, 1970; Farr, Laffey, & Brown, 1970; Hill, 1971). Authorities in secondary reading instruction have suggested two major factors for content teachers' hesistation to accept their responsibility in teaching reading skills.

The first factor was that secondary teachers did not have the attitudes conducive to teaching reading skills in the content areas. Many content area teachers did not perceive reading instruction to be an important aspect of successful content instruction. They frequently stated that developing students' reading ability was the job of the reading teacher or the English department (Hill, 1971; Marksheffel, 1969; Umans, 1963).

A second factor was that content teachers did not have the competencies necessary for the successful teaching of reading in their subject areas. The training and experience of secondary teachers had not equipped them with the skills required for integrating reading instruction with content instruction. Even when content teachers expressed a desire to help students develop better reading skills, these teachers often stated that they did not feel competent or confident in their ability to provide this instruction (Bader, 1973; Burnett, 1966; Marksheffel, 1969; Muskopf & Robinson, 1966).

The authors of this paper suggested an alternative factor influencing secondary teachers' reluctance to assume responsibility for teaching reading skills. The assessment instruments used in most of the surveys investigating secondary teachers' attitudes and competencies in reading did not clearly define the term "teaching reading in the content area." The two most frequently used instruments, the free-responses on open-ended questionnaires and the broad, philosophical statements on Likert scales, failed to provide secondary teachers with examples of the integration of reading instruction with content instruction. Chin and Hesse believed that the lack of specific illustrations or a clear definition of content area reading instruction may have influenced teachers to respond inaccurately or negatively on such assessment instruments.

As a result of this observation these researchers postulated that if secondary teachers were provided with an operational definition of content area reading instruction using specific competencies to illustrate methods of teaching reading in the content classroom, then teachers would be able to report more precise and perhaps more positive data on their attitudes and competencies in teaching reading.

To test this idea, a thorough review of the professional literature on content area reading instruction was conducted to ascertain the areas in which experts believed secondary teachers should be competent. The reading experts recommended teacher competency in the following areas:

- developing students' vocabulary, study skills, and critical reading skills
- assisting students in setting reading purpose, in interpreting graphic and pictorial aids, and in adjusting reading rate
- diagnosing students' reading strengths and weaknesses
- individualizing reading objectives
- selecting instructional reading materials
- designing reading-study guides and questioning strategies
- grouping for reading instruction
- motivating students to read extensively in the content area

For each of these areas, specific competency statements were created to exemplify the integration of reading instruction with content instruction. These competency statements were submitted to a panel of secondary content teachers and reading experts who evaluated each statement on the basis of two criteria questions: 1) Does this statement illustrate a teacher competency in content area reading instruction, that is, does it require a knowledge of reading instruction and its application in the content area? and, 2)

Does this statement apply to all content teachers who use reading materials in their classes?

As a result of this process, 27 competency statements representing content areea reading instruction were derived. Each statement was judged to be an important competency in content area reading instruction, applicable to teachers in all content areas. In addition, the 27 statements, as a whole, represented the areas of competency recommended in the professional literature in content area reading instruction.

To assess separately teachers' attitudes and perceptions of competency in content area reading instruction, the 27 skill statements were randomly ordered on two independent, summated rating scales, the Chin Inventory on Content Area Reading Instruction.

The first scale, Part A of the Chin Inventory, measured attitude toward content area reading instruction. A teacher indicated the degree and direction of his/her attitude toward content area reading instruction by rating the importance of each of the statements on a five-point scale. To increase personal commitment to the response, each statement on this scale began with "To me, ..." For example,

> To me, incorporating into my assignments instruction on how to read regular classroom material is
> VERY IMPORTANT 1 2 3 4 5 NOT IMPORTANT

The number selected on the attitude scale became the weighted response assigned to that item. The sum of the 27 weighted responses was that teacher's attitude score, with a low total score indicating a more positive attitude toward content area reading instruction than a high total score. A total attitude score could range from 27 (1 X 27) to 135 (5 X 27), with any score below 81 (3 X 27) reflecting an attitude on the positive side of the scale.

The second scale, Part B of the Chin Inventory, measured perception of competency in content area reading instruction. A teacher indicated the degree and direction of his/her competency in content area reading instruction by rating his/her qualification to perform each of the skills on a five-point scale. To increase personal relevance to each item, this part of the instrument was prefaced with the question, "How qualified are you. . .?" For example,

> How qualified are you to assist students in setting a definite purpose for reading assigned materials?
> VERY QUALIFIED 1 2 3 4 5 NOT QUALIFIED

The number selected on the competency scale was the weighted response assigned to that item. The sum of the 27 weighted responses was that teacher's perception of competency score, with a low total score indicating a more positive perception of competency in content area reading instruction than a high total score. A total score in perception of competency could range from 27 (1 X 27) to 135 (5 X 27), with any score below 81 (3 X 27) reflecting a perception of competency on the positive side of the scale.

The content validity of the Chin Inventory, as discussed previously, was established through two criteria: 1) the individual statements illustrated specific competencies in content area reading instruction, and 2) the total set of statements presented an operationally defined, competency-based view of content area reading instruction.

The reliability of this assessment instrument was determined by the split-half method. Reliability coefficients of .92 for the attitude measure and .97 for the perception of competency measure were determined using the Spearman-Brown prophecy formula on a sample population (N = 224). The coefficients obtained for each of the subgroups in the sample population ranged from .86 to .98, all of which were highly reliable for group measurement purposes.

The Chin Inventory on Content Area Reading Instruction has been used in three studies conducted in different geographical regions and covering a period of six years. Each of the studies was designed to investigate the factors influencing secondary teachers' attitudes and perceptions of competency in content area reading instruction. Each of the studies are available in the literature and are summarized in Figure 1.

FIGURE 1

SUMMARY OF FOUR STUDIES USING THE CHIN INVENTORY ON CONTENT AREA READING INSTRUCTION

	MEASURE:	
FACTOR:	ATTITUDE	PERCEPTION OF COMPETENCY
Content Area Responsibility	CF, E, K*	CF, e, K
Training in the Teaching of Reading	cf, e, K	CF, E, K
Amount of Teaching Experience	cf, k, c	CF, k, C
Instructional Teaching Level	cf	cf
Certification Program Level	c	C

*Letters indicate the studies that investigated each factor. The letters should be interpreted as abbreviations for the studies:

CF	for Chin-Flanagan (1975)
E	for Evans (1977)
K	for Kozey (1980)
C	for Chin's most recent study.

Capital letters are used if the study found significance at the .05 level. Lower case letters are used if the study found no significance at the .05 level. If the factor was not investigated by the study, that study's letter is not used.

Chin designed a study to answer the following research questions: 1) Is there a significant difference in the attitudes and perceptions of competency in content area reading instruction between preservice secondary teachers and inservice secondary teachers? 2) Is there a significant difference in the attitudes and perceptions of competency in content area reading instruction between inservice secondary teachers with different amounts of teaching experience? 3) Does training in the teaching of reading significantly change the attitudes and perceptions of competency in content area reading instruction of preservice secondary teachers and inservice secondary teachers? 4) Does training in the teaching of reading significantly change the attitudes and perceptions of competency in content area reading instruction of inservice secondary teachers with different amounts of teaching experience?

Data was gathered on Florida preservice and inservice secondary teachers during a two-year period of time. These preservice and inservice secondary teachers ($N = 210$) were enrolled in content area reading courses at the University of Central Florida. There were eight content area reading courses taught by Chin from January, 1979, through December, 1980. Preservice and inservice secondary teachers, whether enrolled in separate undergraduate and graduate classes or in combined undergraduate and graduate classes, received the same reading course instruction. On the first day and the last day of each term's reading course, the teachers were asked to complete the Chin Inventory on Content Area Reading Instruction. Participation in the study was voluntary and anonymous and did not influence in any manner the course grades.

Eight research hypotheses were tested at the .05 level of significance using independent, one-way analyses of variance. The results are presented in Tables 1 through 8. Tables 1 through 4 report the analysis of data obtained on teachers' attitudes and perceptions of competency in content area reading instruction before course instruction in teaching reading. Tables 5 through 8 report the analysis of data obtained on teachers' attitudes and perceptions of competency in content area reading instruction after course instruction in teaching reading.

Chin found that preservice secondary teachers' attitudes ($X = 50.44$) toward content area reading instruction did not differ significantly ($F = 0.46$, d.f. 208, 1, $p > .05$) from inservice secondary teachers' attitudes toward content area reading instruction ($X = 51.82$). Both preservice secondary teachers and inservice secondary teachers reported comparably positive attitudes toward teaching reading in the content areas. However, preservice teachers did differ significantly ($F = 30.86$, d.f. 208, 1, $p < .01$) from inservice teachers in their perceptions of competency in content area reading instruction. Inservice secondary teachers had significantly more positive perceptions ($X = 81.28$) of competency than preservice secondary teachers ($X = 64.64$). It seems appropriate that preservice teachers, having had no regular classroom teaching experience, would feel less qualified to teach content area reading than experienced inservice teachers. It is interesting to note, though, that both the inexperienced preservice teachers and the experienced inservice teachers recognized and valued equally the importance of content area reading instruction.

To analyze the influence of amount of teaching experience on secondary teachers' attitudes and perceptions of competency in content area reading instruction, the inservice teachers were grouped according to different amount of teaching experience 1-4 yrs, $X = 52.08$; 5-8 yrs, $X = 53.16$; 9-12 yrs, $X = 46.10$; and 13-16 yrs, $X = 49.83$. Amount of teaching experience was not a factor influencing inservice secondary teachers' attitudes toward content area reading instruction ($F = 0.56$, d.f. 104, 3, $p > .05$). However, there was a significant difference ($F = 3.49$, d.f. 104, 3, $p < .01$) in inservice secondary teachers' perceptions of competency based on different amounts of teaching experience, but there was no relationship between increased teaching experience and more positive perceptions of competence in content area reading instruction: 1-4 yrs, $X = 69.42$; 5-8 yrs, $X = 64.35$; 9-12 yrs, $X = 50.70$; and 13-16 yrs, $X = 50.16$.

To determine the influence of training in the teaching of reading on secondary teachers' attitudes and perceptions of competency, gain scores for the attitude measure and the perception of competency measure were computed by subtracting the after-course instruction scores (X_2) from the before-course instruction scores (X_1). Independent, one-way analyses of variance were then performed on these attitude gain scores and these perception of competency gain scores.

No significant difference was found between preservice secondary teachers' attitude gain scores (X_1-$X_2 = 7.15$) and inservice secondary teachers' attitude gain scores (X_1-$X_2 = 9.64$). The analysis of data ($F = 2.53$, d.f. 208, 1, $p < .05$) shows that both preservice teachers and inservice teachers increased their positive attitudes toward content area reading instruction as a result of training in the teaching of reading. Thus, while reading instruction assisted secondary teachers in valuing the importance of content area reading instruction, the reading instruction did not differentially affect preservice teachers and inservice teachers.

Chin did find a significant difference ($F = 13.25$, d.f. 208, 1, $p < .01$) in the perception of competency gain scores of preservice teachers (X_1-$X_2 = 25.37$) and inservice teachers (X_1-$X_2 = 17.24$). While both preservice teachers and inservice teachers increase their perceptions of competency through reading instruction, the preservice teachers reported a significantly greater increase in their competency than the inservice teachers. The data reveal that both before course instruction and after course instruction, inservice secondary teachers felt more qualified to teach reading than preservice secondary teachers. When the after-instruction competency scores of preservice teachers were compared to the before-instruction competency scores of inservice teachers, it appeared that preservice teachers with training in teaching reading felt more qualified to teach reading than inservice teachers without training in teaching reading.

Different amounts of teaching experience ($F = 2.57$, d.f 104, 3, $p > .05$) was not a factor influencing the attitude gain scores (X_1-X_2; 1-4 yrs, $X = 5.87$; 5-8 yrs, $X = 13.61$; 9-12 yrs, $X = 12.20$; and 13-16 yrs, $X = 8.33$) of inservice secondary teachers. The perception of competency gain scores of inservice secondary teachers were also nonsignificant ($F = 1.63$, d.f. 104, 3, $p > .05$) with X_1-X_2 scores as follows: 1-4 yrs, $X = 19.39$, 5-8 yrs, $X = 17.00$; 9-12 yrs, $X = 14.55$; and 13-16 yrs, $X = 5.83$. Inservice teachers, regardless of years of teaching experience, gained comparably and positively in their attitudes and perceptions of competency through training in the teaching of reading.

The three studies cited for reader review and the new study presented in this paper investigated the factors influencing secondary teachers' attitudes and competencies in content area reading instruction, using the Chin Inventory on Content Area Reading Instruction. Data on secondary teachers' attitudes and perceptions of competency were obtained over a period of six years in four different regions. Statewide surveys of secondary teachers in Oregon (Chin-Flanagan, 1975) and in Mississippi (Evans, 1977) were conducted. Canadian secondary teachers in one urban area, Regina, Saskatchewan, were surveyed in the Kozey (1980) study. Most recently, preservice and inservice secondary teachers in a state university in Florida were surveyed in the Chin study. These four studies provide much information on the state of content area reading instruction as perceived and reported by secondary teachers. The findings of these four studies are summarized in Figure 1.

Content area responsibility was a major factor influencing secondary teachers' perceptions of content area reading instruction. A significant finding of these studies was that even though secondary teachers reported positive attitudes and positive perceptions of competency in teaching reading, these attitudes and perceptions of competency differed according to content area responsibility. Content area responsibility influenced teachers' attitudes in three studies and influenced teachers' perceptions of competency in two of the three studies. In addition, Chin-Flanagan and Kozey found a similar ordering of content areas in attitudes and perceptions of competency. Ranked from most positive to least positive attitudes and perceptions of competency were language arts teachers, social studies teachers, science teachers, and mathematics teachers, respectively. Evans found language arts teachers more positive in their attitudes toward content area reading instruction than the social studies teachers and science teachers.

Training in the teaching of reading was a significant factor influencing secondary teachers' attitudes and perceptions of competency in content area reading instruction. Three studies found that secondary teachers who had received instruction in the teaching of reading felt more qualified to teach content area reading skills than secondary teachers who had not received instruction. Of the three studies, only one study found training in the teaching of reading to be a factor influencing secondary teachers' attitudes toward content area reading instruction.

Amount of teaching experience was a factor influencing secondary teachers' perceptions of competency in content area reading instruction in two of the three studies. In neither of these two studies, though, was increased years of teaching experience related to increased perceptions of competency. Amount of teaching experience did not influence secondary teachers' perceptions of the importance of content area reading instruction.

Instructional teaching level did not influence secondary teachers' attitudes or perceptions of competency in content area reading instruction. Both junior high/middle school teachers and senior high school teachers reported comparably positive attitudes and positive perceptions of competency.

The certification program level of secondary teachers did not influence their attitudes in content area reading instruction. Both preservice secondary teachers and inservice secondary teachers had similar positive attitudes toward content area reading instruction. Certification program level was a factor influencing secondary teachers' perceptions of competency. Inservice teachers felt more qualified to teach reading in the content area than preservice teachers. When these teachers' attitudes and perceptions of competency were compared before and after instruction, Chin discovered that certification program level influenced teachers' perceptions of competency but not their attitudes toward content area reading instruction. Preservice secondary teachers experienced a greater increase in their perceptions of competency after course instruction than inservice secondary teachers.

Secondary teachers' positive attitudes and positive perceptions of competency in teaching reading were significant findings in these four studies. Contrary to earlier studies that reported content teachers' reluctance to focus on necessary reading skills and content teachers' lack of confidence in teaching reading skills, these four studies discovered that secondary teachers (1) do value the importance of teaching reading in the content areas, (2) do feel qualified to teach reading skills in the content areas, and (3) do feel that they teach reading skills in their content classes.

The authors of this paper believe that these positive reports from secondary teachers can be attributed to the precise nature of the assessment instrument, the Chin Inventory of Content Area Reading Instruction. Since the Chin Inventory provided concrete illustrations of the integration of reading and content instruction, secondary teachers were able to perceive the importance of content area reading instruction. In addition, as secondary teachers recognized the value of reading instruction as a method of good content instruction, their confidence in their ability to teach reading increased. Thus, these four studies found positive attitudes and positive perceptions of competency because the Chin Inventory enabled teachers to respond to competency statements which clearly described reading instruction in the context of content instruction. This competency-based instrument assisted teachers in identifying and accepting their role in content area reading instruction.

The next step in research in content area reading instruction needs to occur in the classroom. Now that there is evidence that secondary teachers do value and feel qualified to teach reading skills in their content areas, answers to the following questions must be investigated: (1) What do secondary teachers do with their students when they teach reading skills in the content areas? 2) What evidence or behaviors indicate that reading comprehension of the content material has occurred? (3) What active reading behaviors do content teachers look for, recognize, and encourage in their students? (4) Are these active reading behaviors content-specific or are they inherent in all content area reading? (5) How do content teachers teach active reading and how effective are these methods in increasing students' reading skills in the content areas?

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PUPIL READING PURSUITS IN CONTENT AREA CLASSROOMS: DATA NEEDED BY POLICY MAKERS

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> At the present, there is no American tradition of educational research relevant to policy concerns, . . .
>
> Basic research has served technological functions, but has ignored school policy. Often 'basic research' seems to mean research from which no policy inference can be drawn.
>
> Actually, different kinds of research do yield various policy implications, but if meaningful benefits are to be gained, policy concerns must enter the thinking of the research worker when the research problem is formulated.
>
> Harnischfeger and Wiley, 1976

Fact: Twenty-eight states mandate that pre-service instruction for all secondary teachers shall include attention to reading in the content area. (Thomas and Simpson, 1979) In Oregon, this means each prospective secondary teacher must take a three credit course entitled Reading and Writing in the Secondary School. In Oregon, this one course usually represents 16% of the total amount of the formal professional education course work required of pre-service teachers.

Fact: As of 1979, all but four states have lists of educational standards that high school students should meet. Twenty states have competency tests for graduation. In Oregon the State Board of Education Standards for School (1976) states, "Each local distict shall adopt and implement a system of instructional program planning and assessment to provide for: Assessment in reading within three instructional programs (content areas) by September 1, 1979 and six by September 1, 1981."

Fact: Studies by Flanagan (1975), Kozey (1980), Chin and Hesse (1980) found teachers of social studies, language arts, math and science report content area reading instruction is more important then not important and rate themselves as being more qualified than not qualified to provide content area reading instruction.

Fact: The literature on the teaching of reading in the content areas reveals little if any information on actual teacher activities and pupil reading pursuits in secondary subject area classrooms.

This paper calls for researchers to begin to gather base line data answering questions "what quality content area reading instruction takes place" and "what is quantity and duration of student content area reading pursuits." Included in this paper will be framework upon which to build such research, a description of desired secondary content area pupils' reading pursuits, and an observational methodology.

It is our belief that data called for here is pertinent to opinion setters who are calling for content area reading instruction, to policy makers who mandate allocation of time and staff in preservice education and in subject area classrooms, and to educators who design secondary school reading programs.

At the present time, reading educators and school administrators lack a clear set of expected/desired student behaviors in content area reading. In addition, we have no way of assessing the teaching of these reading behaviors. Hopefully the framework we describe will be a step toward gathering data that will be helpful in reviewing and setting defensible policy on secondary content area reading instruction.

A Framework for Policy Influencing Research

Harnischfeger and Wiley (1976) developed a comprehensive model for classroom teaching-learning process. Their model emerged as they searched for evidence of teacher effectiveness or the relation of educational practice to outcomes. Even though their model was created with the self-contained elementary classroom in mind, we feel it is an appropriate framework for research in the secondary school.

Central to their model of the teaching-learning process is the pupil's activity. They feel it mediates the effects of district curriculum, school organizations, and teacher's activities.

The outline of their model has six components which fall into three categories: background, teaching-learning process, and acquisition. The second category, teaching learning process, includes teacher activities and pupil pursuits. While they claimed most research tends to be on teacher behavior, we contend current research related to content area reading focuses upon the background components labeled as curriculum institutional factors and teacher background. Frequently this last component includes research related to teacher's attitude toward and perceived competence in the teaching reading in content area. We concur with Harnischfeger and Wiley when they identify pupil pursuits as being central to the teaching-learning process, and we have thus developed an observation guide that will be useful in gathering base line data with regard to pupil reading pursuits in the content area classroom.

Our gross definition of pupil pursuits parallels Harnischfeger and Wiley's. It includes pupil activities and the joint action of the teacher and pupil. Pursuits refer to what teachers and student do in the process of learning, including what appears to be active, passive or oblique activities.

Our framework for measuring the kind, quantity, and duration of student reading pursuits and other activities in a content area classroom was initially developed by systematically observing and recording all classroom activities that occurred. Once recorded, those activities were placed into categories—those which were reading related and those which were not. Since our focus was upon student reading pursuits, most of our further sub-categorization dealt with reading.

The non-reading activities were only sub-divided into two categories, teaching-learning content and non-instruction. For example, having students write a report after seeing a film on cell reproduction is an example of a "teaching-learning content" activity and organizing the class into groups for car pooling on a field trip would be a "non-instructional" activity.

The reading pursuits were sub-grouped as active reading pursuits, passive reading pursuits, and oblique reading pursuits. Each of these in turn were clarified as additional sub-sets of pursuits were identified. A visual display of the categorization of student pursuits in a content area classroom is presented in Figure 1.

FIGURE 1

Student Pursuits In A Content Area Classroom

I. Non Reading Related Pursuits
    A. Teaching-learning content
    B. Non instructional

II. Reading Related Pursuits
    A. Active Reading Pursuits
        1. Pre Teach Reading Vocabulary
        2. Pre Teach Reading or Study Skills
        3. Providing Background Information for Reading

- 4. **Student Reads with Direct Teacher Instruction**
- 5. **Student Practices Skills or Shows Evidence of Active Reading Behaviors Taught**

B. Passive Reading Pursuits

- 1. **Student Reads Silently Using Non Teacher Prepared Material**

C. Oblique Reading Pursuits

- 1. **Student Reads Orally**
- 2. **Teacher Reads Orally**
- 3. **Skills Taught In Isolation**
- 4. **Review, Assessment of Reading.**

Defining Reading Related Pursuits

In order to train observers who could record the kind, quantity, and duration of the pupil pursuits in the content area classrooms, each category of Reading Related Pursuits was defined. Each definition typically included what was meant by the terms used as well as a discussion of why the pursuit was chosen. Examples as well as non examples of the teacher and student behavior or interaction related to each pursuit were also included. These definitions are presented below.

A. Active Reading Pursuits

These are activities which take place in preparation for,, or during reading. The reading is done in content-related material and direct instruction is given by the teacher.

Pre-teach Reading Vocabulary: This category is used if, at some time before the students read, the teacher presents any of the words which the students will encounter in the reading assignment. The literature devotes much space to pre-teaching vocabulary, with most reading and subject matter educators contending that the concepts of content subjects, particularly at the secondary level, can be explained only by use of a specialized vocabulary. Nearly every educator reviewed list as one of the most important tasks of a content area teacher that of teaching students to read and understand the vocabulary necessary to give meaning to concepts which are being taught.

> Students with meager vocabularies often fail to read selections with complete comprehension and often fail to appreciate some of the fine shades of meaning and precision embedded in certain words. Vocabulary development is without question an important factor in teaching students to value reading.
>
> Smith, Otto, Hansen (1979)

Pre-teach Reading or Study Skills: This category is used if the teacher gives the students an instruction on *how to read* the assignment, as, for example, if the teacher demonstrated the use of diagrams, (time lines, maps, graphs, drawings, outlines, or other visualizations of the material to be read), if the students are shown how to skim to get the general idea, how to scan to find specific information from the lesson, how to use references, how to adjust speed to meet the purpose of the assignment, how to take notes or underline, how to write questions, or how to predict outcomes. To be placed in this category, these skills must be directly related to a content area reading assignment. Although most reading courses and many language arts courses teach reading and/or study skills, there is little evidence that skills transfer from general instruction to content area reading. The effect of teaching students to use study skills should be to make them become increasingly independent readers, and studies such as those by Serra (1953) and Johnson (1952) indicate that there is a need for specific instruction in these skills *within the content* in which they are to be used.

Providing Background Information for Reading: In this category is placed any pursuit designed to "set the stage" for comprehension of the reading assignment; it may help the students relate the new information to old experiences, provide motivation for reading, or give them a "mental set" so they will remember what they read. A pursuit does not belong in this category unless there is evidence that the activity is designed by the teacher to help the students understand their reading assignment. A film, for example, may provide background experience for many future reading assignments, but unless the teacher demonstrates that *this film* is to help understand *this reading assignment*, the category is not used. A film will generally be placed under the category of teaching-learning conduct. Other pursuits which might provide background experiences include pre-reading discussions, debates, lectures, field trips, role playing, and orally presented questions about what is to be read. The importance of this category is also well supported by educators who see the need to build a framework within which readers can place information which is read, and which provides a retrieval plan in which . . .

> . . . the rememberer organizes memory search in terms of categories of information marked as important in the schema . . . providing implicit cues or mental pathways to relevant text information.
>
> Anderson, Pichert, Shirey (1979)

Students Read with Direct Teacher Instruction: In this category is placed any pursuit in which students have reading material before them and the teacher is giving the students direct instruction as they read. Students and teacher may be working together to find main ideas, make predictions, determine author's meaning, discussing meanings of words used in a special context, etc. The criteria for using this category are that the printed material must be before the students, and the teacher and students are reacting to the material.

Students Practice Skills or Show Evidence of Active Reading Behavior Taught: If the students are given time in class to practice skills which help them read a specific assignment, this category is used. For example, the teacher may show how to make questions of chapter headings and sub-headings, then direct the students to write these questions as they read. In other instances, students may be displaying evidence of active reading behaviors taught by the teachers. Such active reading behavior include indentifying unknown words, paraphrasing, summarizing, predicting, asking questions, making diagrams, and varying reading rate. (Hesse, Bullock and Chin, 1980) and (Bullock and Hesse, 1981). If the teacher is working with the students (or with one student) and helping them write the questions, this is counted as direct instruction; if not, it is *practice*. One of the major values of teaching reading in content classes is the opportunity for practice of skills and demonstrate the behavior which has been learned. This practice offers immediate reinforcement of a skill, allows the student to see the relevance of skill instruction, and gives the teacher an opportunity to monitor the students as they attempt to use it to extract meaning from the assignment.

B. Passive Reading Pursuits

Here the student reads without direct student-teacher interaction. The material may or may not be content-related.

Student Reads Silently—Using Teacher-Prepared Study Materials: Pursuits in this category are those in which students read silently without any direct teacher interaction. However, the teacher has prepared study materials in the form of questions, word lists, outlines, instructions, or diagrams. Since these materials are handed to the students to read without oral explanations or discussion, the implicit assumption made is that the students can read this material. Since this assumption may not always be valid, we consider this activity less important than oral, direct instruction. However, since the teacher has made some attempt to guide the students' reading, we make a distinction between this activity and one in which no such materials are prepared. If these study materials are given to the students along with oral explanations or discussions, they would qualify as direct teaching, and would be recorded as such, while the reading itself would be recorded as *practice*. Commercially prepared materials, such as workbooks, worksheets, or packaged programs do not qualify as study materials.

Student Reads Silently Using Non Teacher Prepared Materials: We use this category when students read silently without any oral *or* written guidance from the teacher. Students may be using texts, library books, workbooks, reference books, directions for activities, or any printed material.

C. Oblique Reading Pursuits:

Pursuits which are only indirectly related to content area reading, or whose relationship is obscure, are labeled oblique pursuits. These activities may have student-teacher interaction, but lack one or more of the other qualifications for content area reading instruction. For example, reading skills may be taught independent of any subject matter assignments; student or teacher may read orally without attention to reading behaviors, or the interaction may take place after the student has read the material.

Student Reads Orally: This category is used if the students are reading orally and the only help given is in supplying words. (If instruction is provided with word decoding, word or passage meaning, or understanding of concepts, etc., this will be coded as direct reading instruction.) The effect of oral reading on comprehension is little understood; although it is often practiced there is little evidence that it is a valuable reading pursuit, unless used as an adjunct to direct instruction.

Teacher Reads Orally: This category will be used whenever the teacher reads aloud to the class unless (1) it is obvious that the teacher is supplying background or motivation for the reading assignment, or (2) the teacher is demonstrating a reading skill.

Skills Taught in Isolation: In this category will be placed any activity in which a reading or study skill is taught, but without reference to a specific reading assignment. By making this distinction between skills taught in isolation and those which are required for comprehension of a specific selection, we are defining the difference between teaching "reading" and teaching "content reading." When a skill is taught in the situation where it is needed, there is no need for concern about the problem of transfer.

Review, Assessment of Reading: Activities which fall into this category are those which take place *after* a reading assignment has been completed or after the teacher *assumes* that is has been completed. Review is important to the learning of content, but does nothing to help the student read the assignment. Assessment can be a valuable tool for the teacher in planning future assignments, but offers no aid to the student while reading that assignment. Activities included under Review and Assessment include questions (oral or written), discussions, and reports. If, during the review or assessment, the students are directed to specific passages in the assignment which are then read and discussed, this portion of the review is considered direct teaching.

Proposed Data Collection and Analysis Procedures

We have developed an observational scale that will allow researchers to capture the critical raw data needed to make statements about the kind, quantity, and duration of main and sub-categories of pupil pursuit in a content area classroom. Using the observation form, observers can record the time a pursuit began, the participants (teachers and number of students) involved in the pursuit, and a short hand description of the pursuit.

Following the observation in each class, we will total the number of pupils within each of the following categories: active reading pursuits, passive reading pursuits, oblique reading pursuits, content instruction, and non instructional activities. In addition to totalling the number of pursuits, we will also compute the average duration of each pursuit within each of the five categories as well as the total amount of time spent on pursuits within each category.

Finally, we will establish a ratio of time spent on each of the five categories and between the two major categories, reading and non reading.

At the present time, we are sampling social studies and English classrooms at two grade levels—eighth and tenth in order to field test the observational tool, to test its sensitvity, and to begin to get a feel for the power of the data.

Assuming the field test is positive, we suggest appropriate opinion setters and policy makers collaborate in a carefully designed study that would provide them with data needed to make informed data based decisions.

Next Steps and Unanswered Questions

The obvious next step is for these writers to have this proposed data gathering adventure critiques and field tested. The critique should include answers to these questions:

1) Will the data suggested be useful to policy makers—state and local boards and administrators who mandate time and resources be allocated to given educational events?

2) Will the data suggested be useful in a research design that tests the efficacy of content area reading instruction?

3) Is a focus on pupil pursuits as opposed to other components of the teaching learning process appropriate for secondary content classrooms?

4) How will teacher reports of time spent in reading pursuits compare with observational data?

5) What is the nature of out of class student reading pursuits?

Certainly this critique then must be followed by or done concurrently with an expanded field test that will enable reading researchers to make informal judgments about utility of the data to be collected. Ideally we see three or four simultaneous field tests taking place. Those involved in the field test would then collaborate with others in the critique and in designing a large study that will provide policy makers with a baseline and a model for the future.

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WHAT RESEARCH ON PROSODIC CUES MIGHT HAVE TO SAY ABOUT COMPREHENSION AND AUTOMATICITY THEORY

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Research on Rate of Decoding

In a recent article, Stanovich (1980) develops the argument that poor readers who are deficient in word analysis skills may be employing higher level strategies such as using context or intraword redundancy to identify words. Stanovich describes this action as a type of compensatory processing where a deficit in any particular process will result in a greater reliance on other knowledge sources regardless of their level in the processing hierarchy. This idea of compensatory processing could possibly explain why some poor readers seem to be able to comprehend better than they can decode words. Often these students score in the average or better range on intelligence tests. They demonstrate a sound knowledge of the world around them. The theory of compensatory processing would seem to suggest that these children could assign meaning to print based on their recognition of some of the words and their own common sense about how people act and events happen. Perhaps these students also learn a great deal from listening to what their teacher says about a passage or story and have also learned to use many of the cues that are present in questions when they are responding to items on comprehension tests.

Good readers quickly and automatically identify words so that they have attentional capacity left over for comprehension. Poor readers must expend much attention and effort trying various strategies either to identify and comprehend specific words or failing that trying to get some meaning from the text based on their background experiences and the words they can identify. Either way, the task is laborious and can result in comprehension errors.

It would be tempting to conclude from Stanovich's discussion that poor readers should be taught to identify words faster. Some research has already been done which shows that the answer is not that simple. Fleisher, Jenkins, and Pany (1979) report the results of two interrelated studies which were designed to examine the effects of increasing decoding speed on the comprehension of poor readers. Poor readers were trained to read word lists and phrases before reading the passage that contained the words. Scores on subsequent comprehension measures were compared with good readers and untrained poor readers. Fleisher et al. found that decoding training on word lists or phrases did not result in improved comprehension. These findings support the earlier results reported by Samuels, Dahl, and Archwatemy (1974) that students who received speeded isolated word training performed no better on comprehension tests than untrained readers.

Fleischer, Jenkins, and Pany suggested that long-term repeated reading practice of words in context may be a "viable instructional strategy for improving comprehension" (p. 47). They point out that it is not known what aspects of the repeated reading practice are responsible for improving comprehension. They indicate that possibly the procedure could help students to chunk information or to become familiar with the vocabulary and the syntactic structure. Repeated reading may simply reduce the attentional burden of slow decoding. There is another factor that could contribute to the reported improvement in comprehension that results from repeated reading practice. Possibly repeated reading helps readers to associate the prosodic or intonation cues to meaning which are present in spoken language with the printed text where such cues are missing.

Research on Prosodic Cues

Read, Schreiber, and Walia (1979) report a study which suggests that prosodic cues are important signals of the syntactic structure of spoken language. They observed that 6 and seven year olds were not able to correctly identify the subject noun phrases of a spoken sentence if that sentence had a misleading intonation pattern. Using a type of modeling process, first graders were trained to identify the subject noun phrase in a spoken sentence. After each subject had reached the criterion of correctly identifying 4 consecutive multiple word subject noun phrases, they were given 13 test sentences, 9 of which had misleading intonation patterns and the others having multiple-word subjects and normal prosody. Read, Schreiber, and Walia (1979) found that first graders were able to correctly identify noun phrases in only 30% of the sentences with the false contours. But they got 83% of the normal sentences correct. Adult subjects who were given the same task were mislead by incorrect prosody only 18% of the time. In a later *post hoc* study, Read et al. found that those first graders who correctly identified the subject noun phrases most often, even when the prosody was misleading, were ranked as good readers by their teachers significantly more often than those students who were mislead by the incorrect prosody.

Based on these findings, Read et al. developed the hypothesis that learning to read involves, in part, learning to parse or recognize the syntactic cues to meaning in printed text without the use of the prosodic cues which are present in spoken language.

It would seem logical to hypothesize that if children are not able to compensate for the lack of prosodic cues in written text, reading and comprehension difficulties might result. For example, if children rely heavily on duration as a cue to structure in comprehending speech, problems might arise because prosodic cues are not systematically preserved in written language. Periods, commas, and parenthetical modifiers do signal structural information, but other sentence internal structures such as the subject-predicate boundary and some embedded clauses are not signaled by punctuation.

The findings of Read, Schreiber, and Walia (1979) as well as their hypothesis that poor readers may have difficulty learning to compensate for the lack of prosody in written text would seem to provide some insight into what may be happening with poor readers who have poor decoding skills and some compensatory but essentially inadequate comprehension skills. First, these findings point out the strong link between written and spoken language. In order to learn to read, children must learn that certain sounds are associated with certain written symbols. Secondly the results indicate that in order to learn to read children not only need to learn letter-sound correspondences, they also might need to learn to associate the correct prosodic cues with the printed text.

associate the correct prosodic cues with the printed text.

This reminder of the link between spoken language and learning to read and the idea that children might need to learn sound-print correspondences not only on the level of letters, syllables, and words but also on the sentence level supports the method of repeated reading and possibly explains one way in which the method aids poor readers, i.e. it helps them associate sound with print at all levels from the individual letter to the entire sentence. This research on prosodic cues also helps to explain why instructing poor readers to increase their decoding speed for isolated words has little or no effect on their comprehension. If children indeed rely on prosody as a cue to syntactic structure and thus as a cue to meaning, then learning to recognize words quickly out of the context of meaningful sentences and their inherent prosody would do little to improve comprehension.

Informal Study of the Repeated Reading Method

Part I of the following study was done to compare the repeated reading method with the method of instructing children to recognize lists of words rapidly. The purpose of Part II was to try an approach which might be useful in studying the effects of prosodic cues and their contribution to the repeated reading method.

Part I

Four fourth and fifth graders practiced all the words in a passage until they could recognize them correctly and rapidly (word list practice). Then they read the passage aloud and wrote answers to comprehension questions. These same four children read a second passage aloud twice (repeated reading practice) and also wrote answers to comprehension questions. The oral reading of each child on each passage was taped. After the oral reading performances and the comprehension tests were scored, each child's oral reading and comprehension scores on the Word List Practice were compared with his or her own performance on these measures following the Repeated Reading Practice.

Subjects Of the four students who participated in this study, three were fifth graders and one was a fourth grader. All four children consistently failed most of the word attack subtests and consistently passed most of the comprehension subtests of the *Macmillian r* (Smith & Wardhaugh, 1980) end of level achievement tests. The oral reading performance of all four children could be characterized as slow and halting as omissions and substitutions were frequent. Their oral performance did not reflect an awareness of unmarked prosodic cues.

Materials The passages used in this study consisted of the beginning portion of stories selected from a third-grade text that is part of the Macmillian r series. All selections were approximately 125 words long. The comprehension tests for both selections were based on questions included in the teacher's manual that corresponded to the student text. There were four inferential and five factual questions for each passage.

Procedure Each child worked individually with the investigator. Two of the children received the word list practice first and then the repeated reading practice. The others received the treatments in reverse order. In the Word List Practice the child practiced the words contained in the story until all the words were identified rapidly and correctly. Following this, they read the passage once outloud. If they were unable, even after the word list practice, to identify a word in the context of the passage, they were told what the word was. Finally, they took the comprehension test. The Repeated Reading Practice consisted of asking the child to read the selected passage twice. The comprehension test was administered after the second oral reading.

Results The oral reading errors made by each child in both the Word List Practice and in the second reading of the repeated reading practice were scored according to the method recommended by Silvaroli (1976). No attempt was made to qualitatively analyze these errors; they were simply counted. Inspection shows that the childrens' oral reading performance as measured by the number of errors and their comprehension were better when they had the repeated reading practice over word list practice. A non-parametric statistic, the Walsh test (Siegel, 1956) was used to analyze these data. This test which gives significance levels for n's as small as four showed that the differences between the two practices for both oral reading errors and comprehension were non significant at $p = .062$. The finding that comprehension was better thought not statistically significant at the .05 level in the repeated reading practice is not surprising. As Fleischer, Jenkins, and Pany (1979) reported, word list practice did not have an effect on improving the comprehension of poor readers while Samuels (1979) indicated that the repeated reading method did result in improved comprehension. The finding that the children made fewer oral reading errors after they had practiced reading a passage once than when they had practiced the words out of context could be seen as tentative support for the notion presented by Read, Schreiber, and Walia (1979) that children need to practice the process of transferring their knowledge of oral syntax to the printed text.

Part II

The materials used in Part II were selected from the same text as those used in Part I and the comprehension questions were constructed in the same way. The repeated reading practice was also the same as it had been for Part I. But for the patterned practice, the children listened to the passage being read as they followed along in their own text. Then they read the passage aloud once and took the comprehension test. The oral reading errors from both practices and the comprehension tests were scored as in Part I. The children as a group scored slightly better in comprehension and made fewer errors in the patterned practice. According to the Walsh test these differences are significant at $p = .062$. This finding does seem to provide some tentative support for the notion that prosodic cues do have an influence on oral reading performance and on comprehension. At least correction intonation was a factor that was present when the children listened to the passage being read.

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COMPREHENSION RESEARCH AND DIAGNOSIS: BEYOND SINGLE DEPENDENT MEASURES

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Often, we speak of someone as having problems with comprehension in general or define comprehension in terms of a score on a comprehension test. Usually, these tests are made up of many questions which tap various kinds of information and require a multitude of mental gymnastics to answer. At a recent conference, one theme which surfaced in virtually every paper was that comprehension is best defined in terms of a particular criterion task. One reason for this assertion is that a global definition of comprehension which is reliable has yet to find agreement among researchers and practitioners. In fact, such an endeavor is probably counterproductive since there are different types and levels of comprehension, any of which might be sufficient for certain criterion tasks. The position taken by the presenters is that no one measure adequately captures the nature of comprehension. The composite picture of comprehension generated by research strategies adopting a narrow definition of comprehension is not unlike the blind men's description of an elephant.

Another issue which has surfaced recently is the relationship between memory and comprehension (Ortony, 1978). Basically, Ortony (1978) argued that one can remember information which is not understood and conversely, one often understands information but does not commit it to memory. Thus, we can discuss comprehension as an "on line" understanding, without addressing long term retention of what is understood. We often experience this in everyday conversation. For our purposes, however, we are concerned with comprehension *and* memory since most schooling is aimed at the long term impact of learning. The measures we will present all have a memory component, that is, information obtained from prose must be retained and retrieved to complete the tasks.

MEASURES OF COMPREHENSION

Free Recall

Perhaps one of the most popular measures of comprehension and memory for information in text is free recall. In this task, subjects are provided with minimal cues and asked to tell or write all they can remember from a text. This measure depends more on memory ability than most others, and is often criticized as not really measuring comprehension. While this may be the case in some instances, if scored properly, free recall can provide a wealth of information about how the subject organized information from prose and the kinds of relationships established between concepts.

Early on in the study of comprehension of prose, Bartlett (1932) used free recall to measure the impact of the familiarity of a story to a subject. He observed that for stories containing unfamiliar episode structures and content, subjects tended to produce distortions of the story information in their recall. Bartlett (1932) took this to mean that in free recall, subjects' familiarity with textual information impacted on their understanding. Others have more recently observed this result (Anderson & Pichert, 1977; Brown, Smiley, Day, Townsend, & Lawton, 1977).

Meyer (1975) has shown that the structure of texts also impacts on subjects' free recall of information from those texts. Again, if one merely counts how much is recalled, a measure of memory, *not* necessarily comprehension is obtained. Dunn, Mathews, and Beiger (Note 1) have shown that when relationships between concepts in the text structure are considered, a qualitative measure can be obtained. Since Dunn et al. observed differences in the particular relationships recalled by children with various general ability levels, they inferred that differential comprehension existed.

In a broader sense, free recall reflects one set of processes identified by Kintsch (1974) as component parts of a general theory of comprehension. When asked to freely recall information, we probably engage in at least a two-step process. First we have to search our memory for the desired information. Upon locating some potentially appropriate information, we then engage in a sort of hypothesis-testing exercise in order to determine if the information actually is the appropriate information. Up to this point we are engaging in a memory search, not necessarily comprehension testing. We do have information that suggests comprehension directly impacts on these memory activities. First, if information is "meaningful" to us, we are more likely to retain it and retrieve it than if it is meaningless. This follows Ausubel's work (1965) on meaningful learning. Secondly, the organization and interrelationships between concepts in memory probably are related to our understanding of that information, and certainly impact on our memory for it. This measure (organization and relatedness of information) can be obtained from free recall using any number of the text grammars now popular.

The criterion task of free recall then, provides us with information regarding the organization of concepts from prose, the relationships between concepts, the amount of information retained. Comprehension defined in terms of free recall provides information about how the subject organizes and relates information acquired from prose and further, how much information is accessible with a minimal amount of cues or "hints."

Probed Recall

Probed recall is also among the most used measures in research on comprehension of prose. Basically stated, in this task, some probe (typically a question) is made of the reader's recollection of information from prose. There are numerous studies concerned with the nature of specific types of questions and their impact on recall (e.g. Rothkopf, 1980). One commonality among these question types is that the reader is provided with a "hint" or clue as to how the required information is related to other information in prose. For example, if a particular question requested the name of a city in a story, the subject might assume that there was a city mentioned in the story and that its name was mentioned. Here the reader is given a clue as to what specific information is needed. In free recall, the reader is left to personal mental devices to determine what level of information is required and to determine when the "bank" of information is exhausted. Probed recall is more narrow in scope and is used to test for the presence of particular information in memory.

Psychologically, probed recall can be viewed as providing the reader with some direction for a search strategy. This task assesses the availability of information in memory. That is, a means to *access* the information is provided (the probe) and the reader, basing a search on the probe, determines if the information is available in memory. In this case the criterion is provided for the reader.

Again, depending upon how the probe is constructed, this measure may tap either memory *and* comprehension or primarily memory. For instance probe questions which are constructed to elicit the gist or topic of a passage require some level of comprehension beyond memory since the topic or gist may never be stated explicitly. On the other hand, probes which are constructed to obtain"fact" or detailed information probably require memory with little or no comprehension. One extreme example of this type of probe is the cloze procedure. In this case, the context around a word is provided and the reader is asked to recall the appropriate word. This is perhaps the most explicit method of probing the reader's memory. Clearly, there are many levels of probes and the two described represent what might be called the extreme cases. Further, no matter what level of probe is presented, some level of memory and some level of comprehension are required. The interplay between them varies.

In addition to the type of probe, probed recall is impacted by text structure and the reader's familiarity with the text as was free recall. Meyer (1977) has provided data which supports the impact of text structure on responses to probe questions. Meyer (1977) parsed information in passages into levels of importance and asked readers to respond to probe questions designed to tap information at the various levels. She found that probes aimed at important information received more correct responses than probes aimed at less important information—usually details. This impact is similar to, although probably not as dramatic as, that observed in free recall.

Probed recall has also been used to assess the impact of familiarity with a text. Brown et al. (1977) found that with different levels of prior knowledge about a text, their subjects responded differently to certain probe questions which forced the subjects to draw conclusions about a story. Further, Mathews (Note 2) in a recent study found that overall performance on probe questions was enhanced for subjects with prior knowledge about the text relative to subjects who had no such knowledge.

Probe questions provide the reader with guidance in searching for certain information acquired from text, and generally are less demanding than a free recall task. The level of complexity and generality of the probes determine how demanding the task is for the reader. Further, performance varies as a function of text structure and familiarity with a given text. Probed recall, given the appropriate level of question, is a means of assessing comprehension without placing the demands of a free recall task on the reader. It is, although, less sensitive to the organization of and relationship between concepts acquired from prose.

Recognition Memory

Recognition memory is perhaps the most common technique used to assess comprehension in standardized tests. In this task, readers are presented a question or statement and asked to determine if a response presented to them is an appropriate response. We often encounter these items in multiple-choice formats where the proper response is embedded in a list of four or five options.

This task is perhaps the least demanding in terms of mental gymnastics. Kintsch (1974) has proposed that in evaluating a recognition memory task, all one needs to do is scan the contents of memory to determine if the response presented matches with information in memory. Typically, recognition memory is probably most dependent on memory and only slightly influenced by the level of comprehension. There are instances in which comprehension *can* play the major role, but this will be discussed in the section on *Inference Making*.

Generally, recognition memory for information in text is not influenced significantly by the organization of text. In a study on recall of word lists, Naus, Ornstein & Kreshtool (1977), found that recognition memory was not influenced significantly by rehearsal of organizational strategies. Recognition memory does appear to be influenced by prior knowledge about a given text. Brown et al. (1977) found that if a distractor consistent with a subject's prior knowledge about a text, but not from the text, was presented with a sentence from the text, the subject often times selected the distractor as being from the text. This effect was greater for young children than for older children.

Another variable which impacts on performance on recognition memory tasks is the characteristics of the items and distractors presented with them. One aspect of the relationship between the item and distractor which impacts on performance is similarity of meaning. Bransford and Franks (1971) demonstrated that if a distractor item is similar in meaning to the cörrect response, the distractor item is often mistakenly judged to be the correct response. Presumably, the converse is also true. That is, that the more disparate the items, the more accurate the judgments will be.

Recognition memory requires relatively little mental gymnastics compared to free and probed recall. Its primary use in the study of comprehension might be to assess whether or not subjects retain information sufficient to judge whether or not an item was encountered in a text. The psychological processes involve evaluating a match between an item on a test and the contents of one's memory. The subject does not have to generate a response (as in free and probed recall), and has explicit information as to what to search for in memory. In order to measure comprehension beyond that necessary for veridical recognition, items and distractors must be constructed expressly for that task. Specifically, in order to go beyond assessment of "pure memory," recognition of implicitly stated information or inferences must be tapped. The assessment of inference making will be discussed next.

Inference Making

Recent interest in comprehension beyond literal memory has motivated researchers and practitioners alike to examine information which was implied by the text or generated by the reader in response to the text. This class of information falls within the general frame of inferences. Although there are several taxonomies of inferences, we chose to deal with inferences which are based on information in the text (e.g., John is taller than Jim. Jim is taller than Mike. Therefore, John is taller than Mike.) and inferences which are based upon information from the text and information in the reader's knowledge base (e.g., John hit Jim. From our knowledge of hitting we infer: Jim was hurting).

Free recall, probed recall, and recognition memory tasks can all be used to assess inference making. In free recall, the contents of the free recall are simply examined to determine if non-veridical information was based on information in the text of question or the knowledge base of the reader. In probed recall, questions can be structured so as to require the subject to go "beyond the information given." This extrapolation can be based either on information solely in the text or based on information in the text as well as the reader's knowledge base. Probed recall is more directive and produces a greater quantity of inferences than will be found in free recall.

Recognition memory tasks are used to assess inference making by creating distractors which represent possible inferences. Two ways of evaluating inference making are typically used with the recognition task. One is allowing subjects to determine if a possible inference is in fact recognized as coming directly from the text—an inference would be implied, not stated explicitly. A false recognition of the inference indicates that the inference was made. A second method used to test inference making in recognition tasks is to assess recognition of the truth value of a statement relative to the text. This allows the subject to evaluate the truth of a statement based upon the meaning of a text, not merely the explicitly stated information in the text.

It has been suggested that inference making is an indication of one of the highest levels of comprehension (Warren, Nicholas, & Trabasso, 1978). In order to make an inference, the reader must go beyond memory for information within a text and construct some new bit of information based upon expressed or implied ideas in a text. Recently, Kintsch has suggested that there are certain inferences which must be made if a text is to be interpreted as coherent (Kintsch & Vipond, 1979; Kintsch & Van Dijk, 1978). Further, Spiro (1977) has proposed that a significant amount of inference making is necessary in most retrieval tasks. He suggests that when attempting any form of memory task, the reader relies upon the interaction of information from a text and prior knowledge in the reader's memory. Virtually, every model of comprehension relies upon inference making to predict intelligent processing of text.

As before, text structure has been shown to impact on inference making. Kintsch and Vipond (1979) have suggested that when a text is disjointed, inferences must be made in order to establish its coherence. For example, in the sentence *John threw the rock at the window and it shattered all over the carpet,* we probably infer that the rock crashed through the window which caused the window to shatter. This type of inference allows us to establish a meaningful, coherent understanding of the sentence. This is accomplished without an explicit statement that the rock ever touched the window. Most would agree that the sentence was "comprehended" given such an inference.

Spiro (1977) has suggested that, like before, prior knowledge impacts on inference making. His research falls within the scope of a "schema theory" of comprehension. This theory predicts that a reader is pre-disposed to make certain conclusions—inferences if you will—given a certain level and content of prior knowledge. For instance, following the sentences: *All John's friends were at his surprise party. They gave him a number of nice gifts,* and given our knowledge of the usual impact of surprise parties and gifts, we can infer that John was pleased. Again, if a reader made this inference, most would agree that the sentences were "comprehended."

Inferences made to establish coherence in text as well as inferences made which relate a text to prior knowledge may be assessed via free or probed recall as well as recognition memory tasks. The difference lies in how the responses are scored and in probed recall and recognition memory, how the "test" items are structured. To detect inferences, the examiner must be willing to scrutinize "wrong" responses in free recall, ask "leading questions" in a probed recall, and provide carefully constructed distractors in recognition memory tasks.

One issue which bears discussion is that even if an inference is produced, memory for the premise statements from the text may be poor. In a recent study, Danner and Mathews (1980), found that when children identified an inference correctly, they did *not* necessarily recognize the appropriate premise statement. Further support for this position is o be found in a study by Spiro (1977). He found that when presented with infomation about a young couple's conflict over a decision to have a family, readers tended to freely recall information which was an incorrect inference and did not recall the correct information. That is, the readers tended to resolve the conflict by an incorrect inference.

Inference making requires some so-called active processing of information. It goes beyond veridical memory of information. Examining inferences provides a measure of how a reader interprets and integrates information from within a text or between the text and that reader's existing knowledge. What is lacking in this case is a measure of overall memory for information within a text, and how the reader has mentally organized information from a text.

Measures of Processing

Recently, researchers have been investigating characteristics of processes of comprehension. The measures include: 1) Eye movements; 2) Reading time; and 3) Response latency. Although these measures do not tap comprehension directly, they do seem to be related to comprehension in a variety of tasks. Since we are concerned in this paper with measures which reflect more long-term retention, we will discuss these measures only briefly and suggest other sources which deal with them in detail.

Eye Movements: Advances in technologies have provided means of measuring miniscule movements of the eye. Recently, research has been undertaken in which eye movements have been recorded as subjects read texts. The inference being that certain types of eye movements were associated with characteristics of texts. For example, when we encounter an ambiguous pronoun in a text, the search for a clarifying noun is reflected by a scanning movement to a previously encountered noun. Many other variables have been investigated, but reviews by Carpenter and Just (1977), and Just and Carpenter (1980) provide a more detailed discussion and theoretical basis for the studies.

Reading Time: The amount of time a person spends reading a text has also been used to measure variables affecting various comprehension tasks. Kintsch (1974) used reading time to determine the impact of the number of propositions or simple sentence-like units. With the length of the text controlled, he found that the texts with more propositions required greater reading time than texts with fewer propositions. Kintsch (1974) has also related the number of propositions to recall of text when the reading time was constrained. Here he showed that with a fixed reading time, recall dropped as the number of propositions increased. Reading time here was used to assess the impact of certain text variables presumably during the decoding process. This in turn affected comprehension in the form of free recall. Kintsch (Chapter 6, 1974) provides a more in-depth discussion of this research.

Response Latency: This measure is used to obtain information regarding the time required for a reader to respond to some task demand. The basic format is one in which the reader is asked to verify whether or not some information is the same as or accurate with regard to a text. This usually takes the form of a recognition memory task. One such study (Danner & Mathews, 1980) used response latencies as a measure of when a particular inference was made. Danner and Mathews (1980) had children decide whether or not a sentence was accurate based upon information appearing in a story. The sentences were inferences based on two premise statements in simple stories. The stories were written such that the time to verify the inference would be shorter if the inference were made while reading than if the inferences were made at the time of the decision. The response latency data supports the inference-*during*-reading hypothesis. In this case, response latencies were used to assess when the comprehension process in question (inference making) occurred. Danner and Mathews (1980) provide a detailed discussion of this procedure.

CONCLUSION

If we are interested in detecting how the reader has organized information retrieved from memory for a text as well as how much information can be accessed, then free recall is the measure of choice. Additionally, with this task, we can examine the nature of the inter-relationships present in the subject's recall.

The use of probed recall as a means to assess comprehension of prose allows us to tap various levels of memory and comprehension. The various levels are determined by the level of question. By level of question, we mean general *vs.* specific. That is, we can ask a question meant to tap the gist or topic of a passage or we can direct a question towards a specific fact in the passage.

Recognition memory is typically used to assess whether or not a reader retained information from a text. Again, the type of question will determine the level of difficulty of the task, but generally recognition memory is the least demanding of the tasks used to assess retention of text-based information. The recognition memory task can be used to tap many levels of information as could the probed recall task. The primary difference is in the amount of information provided to the reader to aid in the task of retrieving information from memory.

In order to determine whether the reader has gone beyond the information given, inference making is the measure of choice. Any of the measures discussed above may be used to assess inference making. In free recall, we simply examine the contents of the recall to determine if inferences were made. In probed recall and recognition memory tasks, the items (questions) can be structured so that an inference must be made in order to accurately respond. The emphasis in an inference making task is not so much on accurate memory for the contents of a text, but rather on the integration of that information by the reader.

Recommendations for Research and Practice

The researcher and the individual conducting diagnostic activities are at one level engaged in the same type of activities. That is to identify variables impacting on comprehension presumably defined by some task(s). Often times, single measures are used in both research and diagnosis. For example, free recall or recognition memory are often used as the single measure in research efforts (e.g., Meyer, Brandt, & Bluth, Note 3 and Bransford & Franks, 1971, respectively). In diagnosis, often a score below a certain level on a standardized test will enable a student to be placed in a remedial class. These tests most often rely on recognition memory in the form of multiple-choice items. In cases where several measures are used, it is most often the case that the materials to be read in the various measures are quite different making it almost impossible to draw valid conclusions across measures.

There are two solutions to this problem. One is to create equivalent materials based on the difficulty and structure of the texts. For an extensive treatment of readability measures and suggested alternatives, the reader is referred to Kintsch and Vipond (1978). This requires extensive materials development work and pilot testing, but is quite worth the effort. The other option is to assess the reader's retention and comprehension with more than one measure after reading a single text. Although this measure is somewhat problematic with regard to practice effects, we can obtain more complete information about the reader's mental representation and understanding of a text.

When multiple measures based on the same text are used, one way to reduce the practice effects is to present the measures in decreasing order of difficulty. Using this as a guide then, one might elicit free recall as a first task to assess the reader's organization of the information and the amount of information readily accessible with *no* probes. Since the only assistance this will provide the reader is a rehearsal of information already committed to memory, subsequent tasks will be relatively "pure." Following free recall, a probed recall, or recognition memory task can be administered. The items might be structured such that general as well as specific information might be tapped. Additionally, items can be constructed so that the ability to make inferences based on information from the text can be assessed. Further, the free recall data can be scored for the presence of "spontaneously" generated inferences.

In a recent study, Mathews (1980) applied such a procedure in assessing the impact of text structure and prior knowledge on retention of information from a text. This study employed two groups of subjects at two grade levels (fourth and eighth grade). One group at each grade received prior knowledge about a passage and one did not. Children in both groups listened to a target passage and then participated in two tasks—free and probed recall. The free recall was scored such that both the amount and organization of recall was obtained. The probes were written to tap specific information and elicit inferences from the children. Briefly, the results support differential effects of prior knowledge on the two tasks. For the fourth graders, the organization of free recall was different for the two groups, but the overall amount recalled was the same. The probe questions provided additional data which revealed a difference. That is, the group receiving prior knowledge generally had a higher level of correct responses to the questions than did the other group. This was the case for inference as well as "fact" questions. At the eighth-grade level, the differences were not nearly as pronounced in the free recall task and non-existent in the probe recall task.

Based on the results Mathew (Note 2) concluded that for the fourth graders, prior knowledge affected the *organization* and *amount* of information retained. The organizational difference was detected in the free recall task. The lack of a difference in amount based on this task leads one to believe that the actual retrieval processes employed were not affected. The differences obtained in the amount recalled in a probe recall task indicate that in fact more information was available for the group receiving prior knowledge, even though that information was not accessible in free recall. Here, using various measures provided greater insight into the impact of prior knowledge than would be available using either measure alone.

The implications for diagnostic procedures seem fairly straight-forward. If the reader completes various tasks based on the same text, then a more complete picture of that reader's knowledge and understanding of the text can be obtained. For example, if the reader fails to recall a reasonable amount of information in a free recall task and performs adequately on a probed recall task, then remediation in retrieval skills, not reading *per se* might be suggested. If probed recall produces poor performance then a recognition memory task might be suggested. Basically, using this approach, we can determine whether deficits are in the organizational and retrieval skills of the reader (free recall) or whether the information is actually not committed to memory (probed recall or recognition memory). This would suggest attentional problems, memory deficit, or at the most basic level, decoding problems.

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REACTION: COMPREHENSION: BEYOND SINGLE DEPENDENT MEASURES

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"Questions have been a mainstay of reading comprehension instruction for decades." (Pearson & Johnson, 1978, p. 154) The paper presented by Mathews and Camperell obviously recognizes the importance of the brief statement above, for they have done an in-depth analysis of the relationships between comprehension and various approaches to the measurement of comprehension. The authors have touched on a whole variety of related issues in such a way as to stimulate the thinking of practitioners and researchers alike, but in so doing have created a potential problem for readers. In this reactor's opinion, a reader of this paper needs to have a rather extensive knowledge of current theory in the comprehension area to make the connections implied by the authors.

For those not familiar with the work of people like Rumelhart, Pearson and Johnson, and Rystrom to name a few, the whole notion of "top-down" (concept driven) comprehension, "bottom-up" (text driven) comprehension, or "interactive" comprehension models is likely missing from their background knowledge, and therefore precludes an understanding of the intricacies suggested by Mathews and Camperell. For example, it is this reader's understanding that the statements regarding a subject's familiarity with textual information impacting on his understanding of it reflect the position of "top down" theorists, and are better understood in the light of such theory.

Another minor criticism from this reader's viewpoint is the inclusion of the section on eye movements, reading time, and response latency. It would probably have been better to omit their discussion, as that discussion added little to the major thrust of the paper and was presented in a superficial manner.

Aside from those two criticisms, the overall impact of the paper is quite good. The analysis of measures and their relative uses was helpful, and the examples provided were clear. Of particular interest to this reader was the discussion about the problem in using several measures over materials that are quite different from each other. The authors contend that this creates a problem in drawing valid conclusions across measures. However, this approach seems to be a typical one in nearly any clinical setting, where a reading diagnosis might use a variety of tests and a variety of measuring styles. Or, as in the case of a test like the *Durrell Analysis of Reading Difficulty* — might require probed recall on oral reading and listening subtests and free recall on silent reading. Perhaps their analysis will open the way to new approaches to diagnosis and remediation in reading. As the authors said, "The promise of utilizing (these) tasks . . . as diagnostic procedures seems bright." I agree.

REDUCING TEST ANXIETY EFFECTS ON READING COMPREHENSION OF COLLEGE STUDENTS

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The concept of test anxiety as a defined psychological syndrome is about 20 years old (Sarason, 1972). Since the inception of investigation, there have been several hundred articles reporting the genesis, functioning, and possible treatment of test anxiety. Currently, reliable differences between the high and low anxious student can be demonstrated by 1) physiological responses (Wark & Walch, 1974; 2) measures of affective state and trait (Liebert & Morris, 1967; Spielberger & Gorsuch, 1966), and 3) covert verbal responses (Hollandsworth et. al., 1979). These dimensions, body, emotion and internal talk, have been the basis for varieties of test panic treatment.

One of the earliest validated treatments for test anxiety was the behavioral approach of systematic desensitization (Wolpe, 1969). However, that technique for controlling anxiety, effective on other kinds of phobic responses, proved helpful but insufficient in the case of test anxiety. Test anxious students apparently need to learn not only how to relax, but also how to study more efficiently prior to testing (Mitchell, Hall & Piatkowsha, 1975). Both interventions were important; treatment that stressed one or the other was not as effective as techniques that used both (Allen, 1972). Recently, several cognitive components of test anxiety treatment have been isolated and used in successful therapy.

One, a cognitive-attention based intervention technique, was based on the work of Wine (1971). She pointed out that test anxious students tended to observe their own internal physiological disturbances, rather than attend to the item they were supposed to be answering. By teaching appropriate test-wiseness and attention-focusing techniques, she was able to reduce test anxiety. Still more recently, Meichenbaum (1977) and Goldfried (1980) have drawn attention to the covert internal self-talking that anxious students carry on while they are testing. Therapy is based on teaching students to revise their own internal dialogues.

Until very recently, the notion of test anxiety has not been of much interest to reading researchers working with adults, though there have been several studies of the impact of test anxiety on children's reading comprehension (Wildemuth, 1977). In the past year, however, several studies have focused specifically on the college reader. The first showed that high test anxious students have measurably lower reading comprehension than do relaxed students (Wark, Bennett & Wolinski, 1980). Additional research (Bennett & Wark, 1980) discusses how high anxiety may affect the adult's cognitive processes in reading. Anxious and non-anxious students do about as well on items that require a single fact taken from the paragraph in order to answer the comprehension item. But when compared to their more relaxed classmates, anxious students do much worse when required to integrate material from several different places. Anxious students tend to read in this characteristically limited way wherein details are noted, but overall comprehension is retarded.

This paper reports an attempt to integrate previously used treatment techniques and the authors' speculations about cognitive processes under anxiety, to develop and evaluate a treatment technique for anxious college readers.

Subjects

The subjects for this study were enrolled in the four fall and winter quarter sections of an Efficient Reading course at a large mid-western university. The course is a popular, elective academic offering presented through the Department of Rhetoric. There were a total of 84 women and 85 men in the classes. About 10% were freshmen, the rest ranging from sophomores through graduate students. This group can be thought of as a representative sample of middle-range students in a large state institution. As part of the introductory phase of the class, each student took either Form E or Form F of the *Nelson-Denny Reading Test* (Brown, Bennett, & Hanna, 1980), and the 16 item form of the Test Anxiety Survey (Sarason, 1958).

Treatment

At the second meeting of the class a therapist was introduced to the students. He had no prior information about their reading pre test scores. He explained the nature of test anxiety, interpreted the score on the Sarason instrument which the students had taken, and offered to meet in a specific room three times a week for two weeks to conduct a treatment program for test anxiety. Students were informed that the program was experimental, but that it should have some impact on their ability to comprehend material used in the Efficient Reading class. Any volunteers were asked to commit themselves to attend all 6 sessions. Students who signed up for one of the available hours became the experimental group.

Students who were motivated for help, but were not free at the particular hours that treatment was offered, were asked to sign up and indicate when they could participate. The therapist suggested that if possible other sections of the treatment program would be opened. The students who signed up for the "possible" section constituted the motivated-but-not-treated control groups.

The motivated volunteers whose schedule allowed time (N = 8) received the following treatment:

Day 1 — Share experiences in the group to develop some support and rapport, learn the rationale for the treatment, practice relaxed diaphram breathing, and begin progressive relaxation.

Day 2 — Review diaphram breathing, develop whole body cue controlled relaxation. The students were presented with a standard reading anxiety hierarchy, to be used for systematic desensitization (Wolpe, 1969). The hierarchy, based on increasingly difficult reading as defined by the Flesch scale, was used by all the subjects. The standard hierarchy is presented in Figure 1. However, each subject assigned subjective units of discomfort to the scenes as seemed appropriate, and added items at the top or bottom of the scale if desired.

Day 3 — Relax the whole body. Discuss the rationale for systematic desensitization of reading problems, and do scenes 1 and 2. The criterion was 2 presentations of 10 seconds without anxiety.

Day 4 — Relax, do scenes 3, 4, and 5, discuss the rationale for finding the main idea in a paragraph as a way to counteract anxiety, and do main idea exercises (Gilbert, 1966).

Day 5 — Relax, do scenes 6 and 7, review the main idea patterns given as homework, and do *Reading For Understanding* exercises (Thurstone, 1959), including writing down covert comments. The *Reading for Understanding* materials were used because of one important characteristic of these exercises — that readers must attend carefully to the text, understanding the sense of the *total* paragraph in order to correctly complete the exercise. Prior research, (Bennett & Wark, 1980) suggests that high anxious students need practice in reflective or "overall comprehension." The student's covert comments were analyzed to look for negative self-comments and to help students rewrite positive support self-comments for use during test taking.

Day 6 — Discuss the covert comments from Day 5, and develop a self directing script to counteract negative comments and anxiety. Minimally, the script would contain instructions to A) "Be calm," B) "Breathe from my stomach," and C) "Look for the main idea."

The 6 hours of treatment were designed to use interventions proven effective in investigations of test anxiety. The first 3 hours were devoted to relaxation and systematic desensitization for any fear of reading. During the 4th and 5th sessions, students were taught a necessary skill, reading the paragraph as a unit. Traditional test anxiety treatments focused on more general study and test taking skills. But for this research, designed to reduce anxiety effects during reading, there is a specific required skill. In the 6th session the students were introduced to a cognitive intervention: developing their individualized script to integrate previous learning and prompting themselves in anti-anxiety techniques when taking a reading test.

Following the 6th treatment day all students in the Efficient Reading classes took the Comprehension section of Form C of the *Nelson-Denny Reading Test* (Brown, 1973) as an in-class exercise and posttest.. Before administering the test, the instructor reminded the students who had been in the test anxiety treatment to use whatever skills they had learned in the program.

Results

A control group of 8 students volunteered for treatment but were not available during the specified hours. But they were motivated for improvement. Their anxiety scores (M = 7.6) indicated they were only slightly more test anxious than the classes as a whole (M = 6.7). Because the different sections of the class had taken either the Nelson-Denny Form E or Form F as a pre test, all comprehension raw scores were converted to standard scores for comparison. The control subjects had a pre test (M = .254) slightly higher than the total group. In summary, the control group can be characterized as slightly anxious, competent readers, willing to spend extra time to improve their reading.

There were 8 students who had the time available to be in the treatment group. They had a much higher level of anxiety (M = 11.25) than the control group. As a point of comparison, students who score at 11 or higher on the Anxiety Test should be considered for special assistance, since anxiety probably reduces their reading comprehension score (Wark and Bennett, 1981). Their comprehension standard scores (M = -.475) were in fact well below the class average, confirming their need for special help.

The treatment effectively increased the comprehension scores for motivated test anxious readers in the experimental group, compared to the motivated-but-not-treated control group. Initially, the two groups did not differ on the pre test reading scores, t (14) = 1.036 p = .84. The experimental groups increased .573 standard scores, pre to post. This was significantly greater than change for the control group, which in fact dropped .102 standard scores. The difference, reported in table 1, was significant, t (14) = 2.053 p = .02.

Table 1

RESULTS OF READING ANXIETY TREATMENT PLAN

Group	N	ANX	Pre Standard Score	Post Standard Score	Difference Standard Score
Experimental	8	11.25	-.475	.098	.573
Control	8	7.6	.254	.151	.102

t (14) = 2.053   p = .02

Discussion

This study clearly supports the notion that high test anxiety lowers reading comprehension for adults. The data are consistent with prior research on test anxiety in general, and reading tests in particular (Wark, Bennett & Wolinski, 1980). The finding is of some value to the methodology of test anxiety research. External criteria in much previous research has often been highly controlled, but irrelevant, tasks like anagrams. On the other hand, researchers have used changes in grade point average or other important measures contaminated with large amounts of uncontrolled variance. Reading comprehension items seem to offer a mid-range, relevant and interpretable activity.

The treatment program had a positive effect on comprehension. The gain was congruent with other studies involving cue-controlled desensitization (Lent & Russell, 1978), self instruction (Meichenbaum, 1972) and specific skill training (Wine, 1971). The specific skill in this study was that of "seeing" a whole paragraph, a skill chosen for effectiveness on the basis of its presumed relevance to a model of reading under anxiety.

There was one other treatment variable, so far not mentioned in the literature. At the time of the post test, the examiner gave a specific reminder to the subjects to use the anti-panic techniques they had learned. Perhaps a lack of such reminders in prior research accounts for the finding that anti-panic treatment tends to be successful in reducing self reports of anxiety, but not in generalizing to the classroom. The role of positive prompting before testing should be investigated more thoroughly.

The reader will no doubt consider possible biases in the selection of the experimental group. The sample size (N = 8) immediately raises questions of reliability and generalizability of the findings. The major disturbance to the design was class time. Of the 16 motivated volunteers, 8 had conflicts at the time established for treatment; 8 did not. There is no reason to believe that class hour choice is a systematic variable. Yet there were non-random differences between the group. The experimental group was more anxious. But that difference would work against finding any positive effect from treatment. The experimental group had a lower, but not significantly different, pre test reading score. Again, that would mitigate against positive results. The fact that changes took place for even 8 students speaks to the robustness of the treatment effects. It seems reasonable to generalize such findings to other high anxious students who are motivated for change.

Figure 1:

READING ANXIETY HIERARCHY

________ 1. Reading a comic book because it takes you back to the good times when you were a child.

________ 2. Reading a pulp magazine like a western or a romance because you want to relax or get away from a while.

________ 3. Reading an article in a slick magazine like *OMNI* or *REDBOOK* because the title catches your interest and you want to know more about it.

________ 4. Reading the cover article of *TIME* so you can be more current in your social conversation.

________ 5. Reading an article in a magazine like *ATLANTIC* so you can explain your political point of view.

________ 6. Reading an article in a technical scientific magazine like *SCIENCE* so you can discuss it in class.

________ 7. Reading a legal contract before you sign to make a big loan.

PLACE TABLE 1 ABOUT HERE

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THE COMPREHENSION OF MATHEMATICAL LANGUAGE, A COMMUNICATION APPROACH

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Introduction

If newspapers, magazines, and professional journals may be considered representative of the educational concerns of our country then, reading, writing, and arithmetic test scores are certainly in a priority position. Whether scores are actually declining, remaining the same, or increasing slightly, education has been hit with a "back-to-basics hysteria" (Greider, 1979, p. 24) and schools are being asked to focus once again on the teaching of reading, writing, and arithmetic (including basic operations, geometry, algebra, sets, etc.). In most classrooms reading and mathematics are considered separate subjects with little carry-over from one to the other except in the area of word problems. The purpose of this paper is to suggest a means of relating these two areas and ultimately enhancing the students' comprehension and understanding of mathematics.

Rationale

Although opinions as to the exact definition of reading may differ, most educators would agree that the reading process involves the perception, interpretation and evaluation of the printed symbol (Lapp & Flood, 1978). Carroll (1976) suggested that "the essential skill in reading is getting meaning from a printed or written message." (p. 11). With today's emphasis on making mathematics more than a matter of rote memorization where "2 'n 2 'r 4" and "4 'n 4 'r 8" mathematics in essence may become an aspect of reading as it involves the perception, the interpretation, and the evaluation of a printed symbol. When one reads the symbol "cat" hopefully an image of the appropriate animal is evoked. Likewise, when one reads the symbol "2" hopefully an appropriate image of more than one but less than three is evoked. Are the two processes as distinct and discrete as we tend to treat them in the separation of reading and mathematics? When children are able to ascertain the meaning of symbols such as "Dogs and cats are animals." or "Boys and girls are children." we say they are reading. When they are able to ascertain the meaning of the symbols "2 + 4 = 6" or "7 - 3 = 4" we say they are doing math. Is there really a difference?

In reading, the cloze procedure may be used to evaluate or teach comprehension. Sometimes there is only one correct answer as in the case of "____ am in the room." and sometimes there are a variety of correct answers as in the case of "The ______ chased the cat." Similarly, mathematics uses expressions such as "2 + ____ = 7" which have basically one correct answer although it may be indicated by different symbols (e.g. 5, 10/2, 20/4) and expressions such as "2 + ____ > 7" which have a variety of answers. Again, one might ask if there really is a difference.

Examples such as the preceding would indicate that the perception, interpretation, and evaluation of mathematical symbols is not a distinct and separate process. Why then is the reading of symbols such as "2" and "2 + 2 = 4" treated differently from the reading of the symbols "dogs" and "Dogs and cats are animals."?

It has been suggested that to many people mathematics is essentially "something done in school according to someone else's rules" (Jencks & Peck, 1975, p. 371). Math makes little sense and becomes very similar to word calling. One can accurately pronounce all the symbols but has little understanding of the underlying message, little comprehension.

Hands-on experiences have been advocated but something is still missing. What appears to be needed is a method which focuses on the message of such sentences as "2 + 3 = 5" and "6 - 4 = 2". A method which focuses on the communication symbolized by the sentence.

Communication Approach

In recent years Dinnan and Lodge (1976) have outlined a framework for reading instruction which focuses on the message, the communication represented by the printed message. They suggest that all words can be classified as matter or relation references. Matter references being those referring to objects which have volume and weight such as "boy," "chair," and "lamp," while relation references indicate time, space, amount, and quality. Sample time references include "is," "was," and "then;" sample space references include "in," "out," and "near;" sample amount references include "one," "some," and "all;" sample quality references include "good," "bad," and "well." Dinnan and Lodge further suggest that communication basically involves the location of matter references in terms of time, space, amount, and quality relations. The more definitely the sender (be he speaker or writer) locates the matter references for the receiver, the more accurate the communication. Those references not defined by the sender must be supplied by the receiver and can result in miscommunication.

Students are taught to identify and manipulate matter and relation references in order to ascertain the intended message. Using this approach, reading is a meaningful process of identifying relationships, a communication process.

The Reading of Mathematics

In order to determine whether or not this framework could be applied to mathematical language and subsequently symbolic sentences an investigation of the language (both words and symbols) of seven mathematics series published within the last five years was conducted (Sullivan, 1980). Using the definition of mathematical symbolic sentences offered by Heddens (1971) which suggested that symbolic sentences are expressions such as "2 + 3 = 5" consisting of "two or more names for numbers or sets joined together by a relation symbol" (p. 138) the investigator proceeded through 49 textbooks recording the various symbolic sentences found there and the words used to "orally" read them. (Table 1 contains several examples.) These sentences were then used to ascertain the relations (same-different and many-few) between the words and symbols used in mathematical symbolic sentences and the Dinnan and Lodge (1976) matter-relation classes.

The analysis indicated that the matter and relation classes defined by Dinnan and Lodge (1976) were applicable to the words and symbols used in mathematical symbolic sentences. (See Table 2 for a representative example.) The number symbols and the words used to call them be they known values such as "2" or unknown values such as "y" represent the matter class. The remaining symbols represent relations. It should be noted that the matter references used in mathematical language represent matter in general and are not tied to specific objects. For example, in the sentence "1 + 2 = 3," "2" can be horses, cows, rocks, people, buildings, or whatever matter one might care to specify. The relation references needed in mathematics are fewer in number than the relation references needed in ordinary language. While one might need the relations of "sick-well" and "beautiful-ugly" in ordinary language these are not essential to mathematical language.

The next apparent question was whether or not these matter and relation references are used similarly in ordinary language and mathematical language. Dinnan and Lodge (1976) suggest that sentences are expressions of relations and that within a sentence relation references are used to locate matter. Analysis of a representative sample of mathematical symbolic sentences suggested that the same holds true for mathematics. Symbolic sentences contain time, space, amount, and quality references, and these relation references appear to be used to locate the matter references. Table 3 contains sample sentences from arithmetic, geometry, and algebra in which the matter and relation references have been identified.

Implications

It has been noted that to many people mathematics is "something done in school according to someone else's rules" (Jencks & Peck, 1975, p. 371). Use of the matter-relation class framework to teach students to determine the message intended by math symbolic sentences appears to have the potential to make math a meaningful communication rather than a series of symbols committed to memory. However, while using the concepts of matter and relation words and helping children perceive the mathematics symbolic sentences as a form of communication in which the sender is locating matter references (in this case "1," "2," and "3," etc.) using relation references (in this case "=," "+," "⊥," and " ," etc.) care must be taken to insure that the approach does not become a matter of memorization. With this in mind, the following sequence for using this approach is suggested:

1. Establish the concepts of matter and relation references and their functioning in ordinary language.
2. Establish the specific contrasts needed to manipulate the mathematical symbolic sentences. Table 4 contains a listing of 50 words which were found to represent 51.5% of the 44,000 sampled by Sullivan (1980). These words might be considered a starting point. Caution is needed with those words marked with an asterisk. Discrepancies between the ordinary language and mathematical language meanings of those words were found to exist.
3. Teach the students to identify the matter and relation references in mathematical symbolic sentences.
4. Teach the students to interpret and manipulate the references they have identified.

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Table 1

Sample Recordings of Symbolic Sentences and the Words Used to Orally Read Them

Symbolic Sentence	Oral Reading
$1 + 2 = 3$	one plus two equals three
	one add two equals three
	one plus two are three
	one and two is the same as three
$5 - 1 = 4$	five minus one equals four
	five take one is four
	five take-away one is four
	five minus one is the same as four

Table 2

Classification of the Words Suggested in the Textbooks to be Used in Reading Selected Symbolic Sentences

Symbolic Sentence	Words Suggested for Oral Reading of the Sentences and their Classifications
$1 + 2 = 3$	M* r M* r M* One plus two equals three.
	M* r M* r M* One and two are three.
$7 > 3$	M* r M* Seven is greater than three.
3 x 4 = 12	M* r M* r M* Three times four is twelve.
	M* M* r M* Three fours equal twelve.
$\angle ABC \cong \angle DEF$	M* r M* Angle ABC is congruent to Angle DEF
$B \subseteq A$	M* r M* Set B is a subset of Set A
4 qts. $\approx$ ___ L	M* r Four quarts is approximately equal to M* how many liters?

M* represents mathematical matter reference, r represents relation reference.

Table 3

Location of Time, Space, Amount, and Quality Relations in Mathematical Symbolic Sentences

Sentences		References
$3 + 2 = 5$ $5 - 3 = 2$ $3 \times 4 = 12$ $6 \div 2 = 3$	Matter:	Matter is represented by the symbols "2," "3," "5," etc.
	Time:	The order and sequence relations between the matter references are signaled by the spatial position of the symbols to each other.
	Space:	A together-apart relation is indicated by the "+," "-," "x," and "÷" signs. These signs signal the direction of matter references relative to each other.
	Amount:	The amount relations in these sentences are represented by the "=" sign and reflected in the number of matter references being located.
	Quality:	A quality relation is not always present in these sentences. When it is present, it is reflected in the "$>$" and "$<$" signs.
$8 = \frac{2y + 16}{10}$ $3X = 3 = 24$	Matter:	Matter is represented by such symbols as ".8," "2y," and "3X."
	Time:	As in the previous sentences, time is reflected by the spatial relations of the symbols to each other.
	Space:	A together-apart relation is indicated by the signs "+," "x," "-," and "—". These symbols signal the direction of the movement of the matter references relative to each other.
	Amount:	Amount references are reflected in the equality (=) sign and the number of matter references present in the sentences.
	Quality:	Although not present in all sentences, quality references are represented by such symbols as "$>$" and "$<$."
$\triangle CAB \cong \triangleleft DEF$ $\overline{AB} \perp CD$	Matter:	Matter is represented by such symbols as CAB, DEF, and AB.
	Time:	No explicit reference to time is contained in these sentences. However, the words used to read such signs as "$\cong$" and "$\perp$" suggest it is the present time.
	Space:	The spatial relations between the matter being considered is reflected in signs such as "$\perp$" or "//." The "$\triangle$" and "-" symbols reflect the spatial relations within the matter references.

Amount: The amont relations are signaled by the "=" sign and the number of matter references present in the sentence.

Quality: The quality relation within the matter reference itself is implicit in symbols such as " ," " ," and " ."

Table 4

Rank Order Listing of Top 50 Words

the	can	that
•of	this	find
•to	tens	ten
•is	look	set
a	each	five
and	•on	as
•one	three	us
•are	it	or
•in	we	•with
•how	ones	there
•many	page	numbers
what	your	use
two	•by	numeral
you	write	which
•at	hundred	•more
•for	four	do
number	who	

REACTION: COMPREHENSION OF MATHEMATICAL LANGUAGE

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The research, results, and implications seem to be worthy of consideration by teachers as well as publishers of mathematics texts. Classroom teachers might become better acquainted with the basic framework and pedogogical method of the communication approach, thus enabling them to assist children in transferring the message conveyed by mathematical language and symbols. Since many students seem to lack the ability to determine the basic action called for in problem solving, a better understanding and comprehension of the fundamental language used in mathematics texts as it relates to matter-time-space-amount, and quantity, should increase competency in this area.

In many classrooms, much active emphasis seems to be placed on the simple computational process rather than the thought process about problem solving. Computation basically involves competency through practice procedures while problem solving involves comprehension of the problem and its solution. The implications of this study definitely placed major emphasis on the latter.

Publishers of mathematics texts might see implications from this research as a lead into helping teachers within the guidebook framework. Suggestions might be included in lesson plans to assist the teacher in developing and presenting these ideas and principles to students before and during the development of the problem solving process, and as mathematical concepts are presented.

It would be advantageous to have additional research on mathematics texts that were developed during that period in education referred to as "modern mathematics." During the "modern math" era, major emphasis by both mathematicians and texts focused on *understanding* the various processes involved in the mathematical world as they relate to problem solving. The admonition to "clean up our mathematical language" was heard from mathematicians. It is possible that more important than this is a need for a more thorough comprehension of the simple "little words" involved with the relationships of mathematical signs and symbols.

EFFECTS OF REPRESENTATION AND ORGANIZATIONAL FEATURES OF TEXT ON SUCCESS IN MATHEMATICAL PROBLEM-SOLVING

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Developing the ability to recognize and solve problems is an important goal at all levels of formalized schooling—from kindergarten through graduate school. Associated with meeting this objective are the tasks of identifying students' knowledge of skills related to problem solving and determining effective instructional means for developing these abilities. In context of problem-solving in mathematics, Rasch (1960) proposes a simple model for describing the interaction which occurs between a student and a problem in mathematics: (1) the computational ability of the student, and (2) the difficulty of the problem. These two factors are incorporated algebraically into a probability model that operates on the principle that the more able the student is, the greater his or her chance of success will be; and the more difficult the problem is, the smaller the chance will be that the student will solve it (Wright, 1977).

Some anecdoctal evidence exists which proposes that representing verbal problems in math pictorially may aid the student in processing the necessary information to appropriately solve those problems. Pauk (1974), Thomas and Robinson (1977), Sherbourne (1977), and Singer and Donlan (1980) suggest that by drawing an analytic data diagram or picture of the verbal problem students can visualize and clarify facts, principles, and relationships that are less evident from the words alone. In at least one study, some empirical evidence exists that using a drawing to illustrate pertinent information in a verbal problem significantly improves students' ability to solve the problem (Sherrill, 1973). But, in all cases, pictures were used as *aids* to help the student understand the verbal problem. No studies were found where the three parts of the test followed the form *X is like Y*, while the other half specified the manner in which the things being compared were related, e.g. *X is as heavy as Y*. Care was taken not to include familiar similes such as *fat as a pig*, in order to avoid memory effects. The multiple-choice items had four alternatives arranged in random order: (1) correct choice, (2) attractive distractor, (3) irrelevant alternative and (4) an alternative opposite to the correct choice. Two adults independently categorized the multiple-choice alternatives into these classifications with 100% agreement. The appropriateness or inappropriateness of the judgmental items also yielded 100% agreement between the two raters.

Each day's similes practice materials contained one multiple-choice item, one judgmental item and one completion item.

Differences in pre- and posttest performance were analyzed separately for the three portions of the test by one-tailed t-tests for directional hypotheses.

Mean differences in pre- and posttest scores on the multiple-choice portion did not approach significance, although they were in the expected direction. Means were 13.9 and 14.5 with a computed t of .91, $p > .05$. It was noted that many posttest answers were identical with pre-test choices, indicating that the children may have remembered their initial selections. In the planned expansion of the study, alternate forms of the test would appear desirable.

The second portion of the test, in which the children were asked to judge whether similes were silly or not, showed a difference between pre- ($X = 15.4$) and posttest ($X = 17.0$) means that was significant ($t = 1.93$, $p < .05$). The experimental subjects apparently gained considerably in their ability to discriminate between appropriate and inappropriate comparisons.

The third portion of the test, which required the children to complete the similes with suitable terms, would appear to be the most demanding of the three, and it yielded the most interesting results. Differences between test means before ($X = 27.00$) and after ($X = 31.13$) treatment were significant ($t = 3.0$, $p < .01$). Answers were categorized as appropriate (2 points), marginal (1 point), or inappropriate (no points) by two adults, independently. Agreement was very high: in the few instances in which judgments varied, discussion resolved the issue.

The scores of the small control group actually decreased slightly from pre-test to posttest on the judgmental and completion tests. There was a slight gain on the multiple-choice test. None of these pre-test to posttest differences were significant.

The results of the study appear to indicate that, if a goal of instruction is to heighten children's ability to discriminate between superior and inferior examples of the simile and to create acceptable examples themselves, exposing them in a sustained, regular fashion to materials containing similes will substantially advance them toward that goal.

However, several caveats may be in order here. The exposure to these materials was quite standardized in terms of time and hence lacked spontaneity. Also, the practice materials were presented in isolation, apart from a meaningful context and thus were somewhat artificial in nature. While most of the children approached the similes sessions with apparent gusto, a few of the older and more creative children expressed the feeling toward the end of the experiment that the similes exercises were too much of a good thing. One especially talented fourth-grader commented, "Similes are like fleas." "Yes," her tutor retorted, "and you've caught them."

Perhaps a more beneficial course would be to ensure that children, particularly the gifted, are surrounded by an environment rich in figurative language, but figurative language in the realm of children's literature, especially poetry. For those children whose language facility is somewhat less, periodic exposure to and discussion about these forms appears to be helpful.

Another result of the study, which may suggest caution, should be noted. In the third portion of the test, in which the children supplied the completing term of the simile, responses on the posttest were more convergent than those on the pre-test. This was particularly true of one of the kindergarten children, a girl notably proficient in her use of language. It would be distressing to infer that exposure to the similes exercises produced a sense that there was one "best answer" to what should ideally be a heuristic, divergent intellectual activity.

Further extensions of the study are planned, including an examination of children's processing of metaphors and a study of the development of figurative language abilities vis-a-vis Piaget's developmental stages.

ADOLESCENT LITERATURE AS A VEHICLE FOR DEVELOPING COMPREHENSION AND COMPOSITION SKILLS

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This paper describes a technique for combining the effective processing of listening, reading and writing experiences by using adolescent literature in a middle grades classroom. Some significant publications about the comprehension process were connected with two descriptions for guiding listening, reading and writing activities and then applied to two novel procedures to produce the technique. The participating teacher and students evaluated the technique as successful in promoting comprehension. Success was also validated by an analysis of the final composition content.

Review of the Literature

A brief review of the literature indicates that good comprehenders assimilate and accommodate as they comprehend (Pearson & Johnson, 1975). Good readers are more flexible in applying strategies which aid their comprehension and more integrated in their approach to comprehension (Golinkoff, 1976). Through a protocal analysis of reading strategies, Olshavsky (1977) confirmed that factors affecting comprehension are interest, reading proficiency, and author's writing style. These studies support the psycholinguistic position that reading is a problem solving process. Steig (1979), in reviewing several studies of comprehension, notes basic differences between good and poor comprehenders. When readers do not clearly understand the problem solving process, their comprehension is limited even when they can decode the words (Smith, 1967).

Cunningham (1975) has demonstrated how a teacher can guide children's comprehension using a directed listening activity which is then transferred to a parallel reading activity. The steps include: setting a purpose for listening; reading a selection to students; simulating the comprehension task which will be required of students after their reading; assigning children to read; having children complete the task as already demonstrated; conducting discussion. Smith and Bean (1980) explain how content area teachers can integrate each situation was then stated in each of the four representations with the organizational features described above. Each representation and feature contained the same problem question (in prose presentation) appearing at the end of the verbal problems and at the bottom of the pictorial problems. For example, one problem-solving situation involved determining the interest earned on money placed into a savings account. This problem was constructed in pictorial and verbal representations with pertinent-only and pertinent-extraneous organizational features. Thus, from the original eight problem-solving situations devised, a total of 32 items were generated. These 32 items were randomly assigned to four forms of the instrument: each form contained 2 of each kind of representation and organizational feature (e.g., 2 pictorial, pertinent-only, etc.) but only one of the 8 problem-solving situations.

A Latin Square design was used for randomizing the assignment and order of the items to each form to nullify any possible learning effects from one item to the next and to insure that no one of the four forms of the instrument would be more or less difficult than the other. In addition, each form contained 2 distractor items, 1 pictorial representation with pertinent-only features and 1 verbal representation with pertinent-only features. While each of the 32 regular items appeared only once across the four forms, the same 2 distractor items described above appeared on all four forms. Approximately four items appeared on each page of the four forms of the instrument with work space provided adjacent to each item for the students to show their computations. A cover-sheet for the instrument contained demographic questions (i.e., name, school, grade-level, math course title, and sex) and instructions for completing the instrument. The reading difficulty level of the verbal representation items was computed to be between the 5th and 7th grade level, according to the Raygor Readability Estimator and the Fog Index Readability Formula.

Procedure

The instruments described above were administered to the original 732 subjects during a three-week period in September, 1980, by trained testers (graduate students in statistics). The testers replaced the classroom teachers during one regularly-scheduled, 55-minute mathematics class period and administered both instruments. To prevent the possibility that the percentage computation test might prompt the students as to the types of mathematical computations they should use on the problem-solving test, the problem-solving instrument was administered first. Each student was randomly distributed one of the four forms of this instrument so that approximately one-fourth of the students in each classroom group completed each of the four forms. No time limits were invoked for this instrument, and all students completed it within approximately 25 minutes. The test administrators then collected the problem-solving instrument, distributed the computational screening instrument, and presented the directions as described above. All the students completed this instrument within approximately 15 minutes. For both instruments (though not directly applicable for the present study), students were expressly encouraged to show all of their jottings and mathematical computations for each item in the spaces provided.

For the purposes of this study, only the data from the problem-solving instrument of those students who scored 80% or better on the computational screening instrument were analyzed. Data for items on the problem-solving instrument were bivariate: each item for each student was scored as either correct or incorrect. These data were divided for analysis according to the two types of percentage problems included on the instrument. The data for the two types of percentage problems were then analyzed using an analysis of variance for the following three variables: form (of the instruments), textual constraint (kind of representation and organizational feature), and item. Orthogonal contrasts were used to identify effects of representation (pictorial vs. verbal) and organizational feature (pertinent vs. extraneous information). Finally, a two-sample t-test was used to determine differences between the Type I and Type II percentage problems.

RESULTS

The number of copies of the different forms of the problem-solving instrument available for analysis depended on the number of students taking each form who achieved 80% or better on the computational instrument. The totals are as follows: 59 Form 1; 59 Form 2; 52 Form 3; 75 Form 4. Results of the analysis of variance for forms, items, and textual constraints for Type I percentage problems were computed by analysis of variance techniques. The results indicate that there was a significant difference ($p = .02$) between the textual constraints. Further analysis using orthogonal constrast indicated that a significant difference ($p < .001$) existed between the organized features of pertinent-only and extraneous information. The mean number of correct responses for the pertinent-only features were 43.1 and 29.5 for the extraneous features. No significant differences ($p > .20$) were found between the pictorial and verbal representations. No significant differences ($p > .10$) were found to exist between the randomized ordering of the items on the four forms of the instrument. Although the items were randomly assigned to the four forms according to the Latin Square design to assure that no one form would be more or less difficult than the other, a significant difference ($p < .02$) between the forms of Type I items was found. This difference, however, was due to the fact that more Form 4 instruments were included in the analysis than the other forms. The mean number of correct responses (of four items per form) to Type I percentage problems for the four forms were: Form 1 = 2.05; Form 2 = 2.60; Form 3 = 2.50; Form 4 = 2.60. (Note: The only analysis affected by varying numbers of the different forms used was the comparison of difficulty of the forms).

Analysis of the variance for forms, items and textual constraints for Type II percentage problems was used to explore differences. Results of the analysis of variance indicate that, at a p-value of .04, there was a significant difference between the textual constraints. Again, further analysis using orthogonal constrasts showed a significant difference ($p < .02$) between the organizational features. The mean number of correct responses for the pertinent-only feature items was 32.37 and the mean for the extraneous feature items was 28.0. Although the assignment of items to form and order of items presentation was randomized according to the Latin Square, significant differences were found between both the forms ($p < .002$) and the items ($p < .004$) for Type II items. Again, significant differences between forms were due to the number of each form included in the analysis. The mean number of correct responses (of a total of four items) for each form was: Form 1—2.10; Form 2—2.08; Form 3—1.85; Form 4—2.01. (See previous note) According to another multiple-comparisons test, Item 5 was significantly easier ($x = 37.0$) than the other "B — (A% of B)" items: x (Item 6) = 29.75, x (Item 7) = 28.25, and x (Item 8) = 24.75.

The results of a two-sample t-test for identifying differences between the Type I ($x = 36.5$) and Type II ($x = 29.9$) percentage problems showed a t-score of 3.91. At a p-value of .005, Type II "B — (A% of B)" percentage problems were found to be significantly more difficult than Type I "A% of B" problems.

DISCUSSION

In response to the first question posed in this study, the data indicate that students' problem-solving success was not significantly affected by representing percentage problems pictorially. Evidently, the students who are able to compute percentage problems would not benefit from dealing with pictorially represented problem-solving situations before they are exposed to verbal problem situations. At first we were somewhat surprised to find that presenting mathematical problems pictorially did not significantly decrease difficulty. The subjects in our study, however, had already mastered the computational part of problem-solving. Prior support for representing mathematical problems pictorially has focussed on the marginally-successful student, and the representation has been viewed as an aid to improving problem-solving ability. A subsequent analysis of the data including students whose mastery of the percentage computations was marginal (e.g., between 50% and 70% on the computation instrument) might indicate that pictorial representation of mathematical problems aids less able students.

Turning to a discussion of the second question, subjects' problem-solving ability was powerfully affected by the presence of organizational features in the items. The subjects' scores on those items which included pertinent-only information were significantly higher than the scores on items which featured extraneous information. This finding supports the contention of Arter and Clinton (1974), Biegen (1972), Faford (1977) and others that success in problem-solving is dependent on effective channeling of pertinent features with sensitivity to extraneous information. In addition, we see this finding as an elaboration on the work done by Brown and Smiley (1977) and others who have concentrated their work on students' ability to extract meaningful information from non-problem-solving prose. Studies currently being conducted to examine learners' progress from immature to mature processors of text information provide promising procedures for studying problem-solving ability. Further studies are necessary which help to identify mature learners' awareness of the skills necessary to solve problems and to provide them a cueing system which aids in the development and application of those crucial skills.

For the third question, at present we are not able to identify a hierarchy of difficulty in problem-solving on the basis of representation and organizational feature. In this initial investigation, we determined that mathematical percentage problems which included extraneous features, whether represented pictorially or verbally, were more difficult to solve than those problems which included pertinent-only features and were also represented pictorially or verbally. Further, problems in the form "A% of B" were significantly easier than those of the form "B — A% of B". Thus, with these subjects, the level of difficulty of the type of problem along with the organizational features provided to the student accounts for the difficulty of the problem, not the representation.

Investigation concerning students' ability to problem-solve under various manipulations of representation and organizational features is just beginning. As we have noted by the large number of students in this study who were unable to score successfully on the screening instrument, we cannot assume that ability to compute percentage problems is mastered prior to entering Algebra. Further studies involving percentages problem-solving will have to be conducted with students enrolled in more advanced courses. These studies which involve problem-solving have an exciting nature about them. The more we learn about what and how representation and organizational features influence the text difficulty of problem situations, the more able we will become to teach students how to solve problems.

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REACTION: EFFECTS OF REPRESENTATION AND ORGANIZATIONAL FEATURES OF TEXT

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Analyzing basic problem solving from perspectives normally associated with reading provides insights, both for students of reading and mathematical problem solving. Unquestionably, both theoretical and instructional theories of mathematics and reading share a great many commonalities. An opportunity to look at one of these commonalities, namely word problems, has been provided in the research of Blohm and Wiebe. As you have noted, the researchers sought to answer three questions in their preliminary investigation. First, could pictorially presented word problems with only minimal but pertinent contextual cues (a data diagram, i.e., the equivalent of a structured overview), enhance or facilitate correct solutions? Second, could extraneous pictorial and contextual information affect students' abilities to solve word problems? Third, given the four experimental conditions—(a) pictorial representation with pertinent-only organizational features; (b) pictorial representation with pertinent and extraneous organizational features; (c) verbal representation with pertinent-only organizational features; and (d) verbal representation with pertinent and extraneous organizational features—would there be a hierarchy of experimental conditions affecting students' abilities to solve percentage math problems?

Before commenting on the research, several compliments would seem in order. Blohm and Wiebe have presented a preliminary research study which is clear, concise, inventive and open. The quality of the presentation could serve as a model for others and future replication.

The research, as good preliminary research often does, raises more questions about the variables in the study than it answers. The answers are: (1) for the sample, one of the two types of percentage questions was easier (2) for the sample, non-pertinent math information when added to either pictorially or textual presentations, does not seem to help solve certain percentage problems. It would appear that these conclusions can be supported, given the data provided and answer partially three research aims of the study. Now, a few of the questions. What part does computational ability play in the scheme of things (e.g., why 80%)? Could age, grade or percentage computational ability have been used as an independent variable? (There was probably a pretty healthy age range between the youngest 10th grader and the oldest 12th grader. However, data on the sample was minimal.) If the study procedures are to be followed in replication, one should anticipate that only about one-third of a 10th-12th grade population in Algebra I and II could obtain 80% correct on a simple percentage test like the one used in the study. Furthermore, if the experimental conditions are introduced before the screening device, there is no way to ensure that only one form might have been used by those few who meet the 80% correct criterion. Also, it is apparent that one of the two types of the percentage problems is obviously more difficult and that "piloting" the forms and the items might avoid future problems.

In summary, the Blohm and Wiebe study provides some answers (and a great many questions) to the mysteries surrounding pictorially and textually presented information in math word problems. One does not have to look too far in the literature of reading to find just as many questions being asked about the mysteries surrounding the use of pictures in stories to enhance or facilitate comprehension.

THE EFFECTS OF INTEGRATING LANGUAGE AND SPELLING LESSONS WITH READING INSTRUCTION ON THIRD GRADE STUDENTS' ACHIEVEMENT IN VOCABULARY AND READING COMPREHENSION

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Language arts instruction has for many years been a great concern to educators throughout the nation. In May, 1978, Ernest Boyer, Commissioner of Education stated, "We must recognize the centrality of language. Language is the connecting tissue which binds us all together." In recent years, there has been a great deal of interest in the interrelationship among the various language abilities. (Artley, 1950; Hughes, 1953; Winter, 1957) There have been many attempts at coordinating and integrating the language arts in an effort to improve achievement in these areas. (Stauffer, 1966; Stauffer & Hammond, 1967; Callaway, Mason, & McDaniel, 1972; Callaway, Mason, Salmon, & McDaniel, 1974)

Boehnlein and Retty (1977) in a review of the integration of the communication arts curriculum pointed out that while it is difficult to find empirical evidence of the superiority of one curriculum over another, most authors of language arts methods textbooks suggest an integral approach with stress on the individual needs of the child. This research project was an attempt at integrating the reading, language, and spelling instruction of third grade students at Lithia Springs Elementary School in Douglas County, in an effort to improve their achievement in the language arts.

There was a great concern among the third-grade teachers and the principal of Lithia Springs Elementary School, that the language arts program was not correlated to allow students to progress at their instructional level. Many of the students coming to the school in the third grade were reading below grade level, a half year to a year or more.

The instructional level of reading was assessed and students were taught at this level. However, all students were expected to perform assigned tasks from the third-grade language and spelling books. This caused some students to be greatly frustrated and doomed to poor achievement.

The purpose of this study was to compare the achievement of students whose language arts instruction was centered around their basal reading program with that of students being taught in a traditional language arts program using the reader, language book, and speller in separate sequences.

METHOD

Subjects

the pupils chosen for this study were all third-grade students from Lithia Springs Elementary School. The students were assigned to reading groups according to the reading level they had achieved the previous year and on the basis of previous teacher recommendations. The students were then randomly assigned to reading classes on their level. Scores from classes only in the middle range of achievement were tabulated. Thirty-six students comprised the basal-centered language arts program; one class of students was reading in the second grade, second reader, and one class was reading in the third grade, first reader. The traditional language arts program, 44 students, was made up of one class which was in the second grade, second reader and one class that was reading in the third grade, first reader.

Materials

Basic materials used in the language arts program were the system curriculum guide, county-adopted basal textbooks, and supplemental materials, both teacher-made and commercial. The curriculum guide and textbooks supplied the foundation for planning instruction.

The curriculum objectives for language arts had been referenced to the basal readers, language book, Georgia Criterion Referenced Tests, and the Wisconsin Design for Reading. Since it was referenced by page number, teachers were able to correlate instruction plans quite easily.

The Wisconsin Design provided excellent supplementary materials with its three components: word attack, comprehension, and study skills. The activities in this program helped teach and reinforce the language skills as well as the reading skills. It also provided a management system whereby skills attempted and mastered were recorded on individual record cards. Because of this, the teacher was kept aware of the students' progress as well as their needs.

Library materials were ample and readily accessible in the school. Films, filmstrips, newspapers, and magazines were available, as well as books for enjoyment and information. Overhead projectors, recorders and cassettes, and record players were also available for use by the teachers and students.

Teaching Procedures

Four third-grade classes, originally 101 students, from Lithia Springs Elementary School participated in the study. Two classes were assigned to the experimental group and used a basal reader-centered language arts program. Two classes were assigned to the control group and used the traditional language arts program with reader, language book, and spelling book as separated sequences.

The *Comprehensive Test of Basic Skills* (reading and language subtests) was administered to the third-grade classes on September 25, 1978, and at the end-of-year on May 14, 1979. The students in both groups were taught their language arts program for two hours each day for 140 days.

The control group followed the traditional method of instruction. Language arts was divided into three distinct academic subjects: spelling, language, and reading. Basal tests were provided for each subject area.

Thirty minutes daily were allotted for spelling. The students were instructed using the series, *Basic Goals in Spelling*, (McGraw-Hill, 1968) which presented word groups which represented the most common spelling of English sounds and gave limited attention to uncommon spellings. Spelling words were presented in units; each unit was divided into 5 sets of activities, the fifth activity being the weekly spelling test.

The control group used *Our Language Today*, (American Book Company, 1974) as the language text. This book offered a balanced program in grammar, composition, literature, and linguistics with emphasis on practice. Language instruction was planned for a 45-minute period. The teachers taught the book chapter by chapter and used resource materials if the students needed additional practice.

Reading in the control group was taught using the second and third grade basal readers, *Shining Bridges, Better Than Gold*, and *More Than Words* (Macmillan, 1974). Teachers planned for a 45-minute period using the publisher's recommended lesson plans. The first segment included the building of background, vocabulary, preparatory exercises, and silent reading. The second segment was the guided oral word reading and teacher-directed activities (phonics, comprehension, study skills). Provision for individual differences and enrichment activities were the last segment of the lesson plan. Two or three days were required to accomplish the activities, depending on the students' achievement.

The experimental group spent the two-hour language arts block in an integrated program. Reading, spelling, and language were meshed into a single subject which students and teachers referred to as language arts. The same basal reading texts were used for the experimental and control groups. The difference was that the primary focus of instruction for the experimental group was the basal reader. Spelling books were not used, and language books were used when more practice on a specific language skill was needed.

The new vocabulary words for the stories in the readers became the students' spelling words. Teachers presented these words in the context of material to be read; then the words were used in oral activities, personal writing, or composition and skill-building activities as given in the teacher-directed activities and the curriculum guide. Spelling grades came from a weekly test of the vocabulary words.

Teachers planned language instruction using the specific skills presented in the teacher-directed activities. The skills were taught to the students and reinforced through practice in the language book. Vocabulary words used in spelling were also correlated with the language instruction. Careful attention was given to the program planned for the experimental group to insure that all the language arts objectives in the county curriculum guide were taught. Supplemental or resource materials supplied any missing practice.

Students in the experimental group read the stories silently after the background was built and preparatory exercises completed. Then, guided oral reading was done and language skills were presented using the teacher-directed activities. Independent and enrichment activities broadened the students' experiences. Two or three days were required to complete a story in the basal.

The test scores from the *Comprehensive Test of Basic Skills*, Reading Subtest Level 1 Form 5, (McGraw-Hill, 1974) for the experimental and control groups were compared at the end of the school year to determine if there was a significant difference in achievement between groups. Groups were compared for similarity using the t-test. Since the groups were not similar, analysis of covariance was used to analyze the final data.

RESULTS

Scores were analyzed using analysis of covariance with the pretest score as the covariate, the instructional method (group) as the independent variable, and posttest achievement as the dependent variable. Table 1 summarizes the adjusted and unadjusted mean scores for the groups.

The analysis of covariance for reading achievement revealed no significant differences between the main effects by groups in vocabulary, $F(1, 79) = .848$, $p < .05$; in comprehension, $F(1, 79) = 1.99$, $p < .05$; and total reading score, $F(1, 79 = 2.60$, $p < .05$.

CONCLUSIONS

The suggestion from the literature that a program which carefully coordinates experiences in language arts instruction should benefit students, was not confirmed by this study. Even though the experimental method might have capitalized

TABLE 1

Mean Scores From Reading Posttests

Measure	Group	N	Unadjusted Mean Scores	Adjusted Mean Scores
	C	44	4.21	4.27
Vocabulary	E	36	4.19	4.11
	C	44	4.37	4.60
Comprehension	E	36	4.44	4.16
	C	44	4.19	4.32
Total Reading	E	36	4.17	4.00

on the strengths of both interrelated and traditional basal programs, the combined effect was no greater than the impact of the structure in a basal reader or the application practiced in interrelated experiences.

However, the question is due further investigation as more demands are imposed on instructional time, as textbooks become more expensive, and as proof of practice for life roles is demanded. The effects of basal-centered communications instruction on achievement in other subject areas should be considered, as well as the attitudes of students and parents toward instruction.

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THE DEVELOPMENT OF CHILDREN'S COMPOSITION FOLLOWING TARGETED DISCUSSIONS OF A DISTINCTIVE LITERATURE SELECTION

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This paper presents a status report of a continuing study of the growth of children's composition after targeted discussions of children's literature. The assumption underlying the study is that active comprehension of a distinctive model of literature provides an awareness of the structure of narrative prose which transfers to the student's own writing. Guided verbal interaction focused on story elements brings about deeper understanding of prose construction.

Rationale for the Approach

Teachers of language arts are sometimes caught between polar ideas: that writing is learned behavior—frequently inconstant and laborious, and that creativity in written expression should not be stifled by excessive formal instruction.

A middleground is suggested by Schiller (1970), Moore (1978), Hillerich (1979), and Blake and Spennato (1980) who propose that teaching the art of writing should occur within a conceptual framework often sequenced over specifically designated time frames. Most of these proponents of structured teaching of composition suggested a process which includes orientation and pre-writing experiences, idea production and generation, revision and editing, and product sharing.

If carefully sequenced instruction can facilitate the development of children's writing, can analysis of a worthy literary model, as a part of the instructional process, increase student awareness of story elements? Through discussion of author intent and style, can children transfer knowledge of literary models to their own creative writing? These questions are basic to the proposed teaching strategy which begins with appreciation of a literary work and continues with targeted discussion of story elements followed by student writing activity periods. It is assumed that students can grasp the elements of composition by observing the patterns employed in an excellent model, and that higher order questioning during discussion permits transfer to the student's original work.

Support for the procedure is found in discussions of active comprehension by Singer (1978) and Pearson and Johnson (1978) who emphasize the use of modes of questioning which are directed toward problem solving and which place a premium on satisfying reader curiosity. Lundsteen (1974) also advocates group problem solving discussions in which the process is controlled but not the specific content. In this procedure questions are formed to elicit transfer of ideas. Lundsteen believes that this mode of questioning helps children to learn, "to be persistent, to feel free to be original and open minded, to empathize, to think of the 'whys' and to communicate interactively." McConaughy (1980) cites evidence that children in the early and middle grades may need the help of specific probe questioning in order to focus on higher levels of story comprehension.

Relating reading comprehension to the structure of written prose is not automatic for individuals of any age. Gage (1978) suggests that students face difficulty in thinking of writing as a rhetorical process if they have not been taught to read rhetorically. He suggests that current reading comprehension instruction makes no distinction between meaning and significance, and that students unable to make the distinction have difficulty establishing intent in their own writing. The procedure described in this study purports to help children to make these distinctions in order to develop more fully their own composing styles.

The Writing Group

Subjects for this study are a group of eight seventh-grade youngsters at St. Benedict's School, Richmond, Virginia. The group of 4 girls and 4 boys are volunteers who agree to "keep up with any work missed" in the English classes from which they were excused to attend the writing workshop. Although no attempt was made to control intelligence or creativity variables, the group represents an ability range from gifted to low average and includes one diagnosed disabled reader. The students have previously had extensive instruction in traditional English grammar and literature, but have had few opportunities for creative writing. Socioeconomically, they represent the range of the white middle class in the Richmond, Virginia area.

The Procedure

The procedure used to integrate comprehension of the literary model with writing performance employs the comprehension model of Goodman and Burke (1972) as an organizing format for questions. Verbal interaction strategies patterned after Ruddell's (1974) model elicit observations about story characters, character development, events, plot, and theme. Schiller's (1970) model for teaching the art of writing forms the basis for the corresponding writing activities following discussion sessions. Discuss periods of 15-to-20 minutes are followed by writing periods of 15-to-20 minutes. As the writing progresses, oral discussion is brief and informal, and writing is sustained for longer periods. No session exceeds 50 minutes in duration. Two of the sessions were videotaped for specific analysis.

The literature stimulus for the study is *Mrs. Frisby and the Rats of NIMH* (O'Brien, 1971), a Newberry Award winning book selected on the basis of timely plot and theme, development of strong nonstereotyped characters, and vivid description. A collection of unique objects including some oriental articles, a World War II Nazi armband, an unusual necklace, and a mood ring are stimulus objects for initial writing. Students are asked to write a story telling something about the object, who might have been associated with it, where it might have been found, and what events may have happened around the object. (Veitsch, 1977).

The following Outline presents the procedures followed in the "Listen, Discuss, Write" approach:

Suggested Procedures for Integrating Literature and Composition:
Listen, Discuss, Write.

Step One. Initial Writing

1. Overview of the approach.
   (Middle school students deserve an honest explanation of the activities and tasks to be undertaken.)
2. Obtain a beginning writing sample or a "starter story." (15-20 minutes) Suggestion: Use the "Trap Door Method," by Tom Veitsch, (1977), (people, object, situation).
3. Present a synopsis of the literature model.
   Suggestion: use filmstrip or film presentation as an overview.

Step Two. Descriptive Writing

1. Review of initial writing.
   Identify characters or objects to be described.
2. Ask students to listen for descriptive words (related to senses) actions that characterize the individual work patterns that convey images.
3. Read selected passages related to character or object description.
4. Discussion of author techniques.
5. Relate to a character/object in your story.
6. Write a descriptive passage about your story character/object (15 minutes).
7. Story sharing.

Step Three. Developing the Plot

1. Read passages illustrating the events which precede the pilot.
2. Ask students to recall events, identify main event and note the relationship of story parts.
3. Discuss the order of events in their stories. Talk about various strategies for organizing the composition. Discuss the impact of the theme.
4. List the story events and story plot or subplots. (15 minutes)
5. Sharing.

Step Four. Elaborating the initial Story.

1. Review previous steps taken.
2. Read "model" conclusion and share other story conclusions.
3. Discuss possible conclusions and the need to draw the story to a close after the climax.
4. Write the elaborated story (longer session).

Step Five. Critiquing the Story.

1. Students share stories in dyads or small groups and observe such aspects as vitality, logic, clarity. Changes are suggested.
2. Read story portions to focus on transitional elements, ordering.
3. Use sentence combining and paragraph linking techniques to develop fluency in student story samples.

Step Six. Refining the Vocabulary.

1. Reread literature model portions to focus on vocabulary selection.
2. Brainstorm to generate descriptive and appropriate work choices.

Step Seven. Editing the Elaborated Story.

1. Proof and edit.
2. Present in final poliched form — typed and bound.
3. Share with appropriate audience.

Samples of student writing are gathered, logged, and filed at almost every session. Development of written expression is examined using a holistic scoring method (Myers, 1980) as opposed to primary trait, analytical scoring, or discourse scoring. Holistic scoring, according to Myers, assumes that,. ." In a writing assessment students should write, and that error counts alone cannot accurately reflect competency levels." Holistic scoring includes establishing prototypes. Holistic scoring can yield a group profile of students showing the range of writing skill. A sample over time is needed to make a statement about an individual's writing competency. Criteria for feature analysis are adapted from Myers (1980) and Glazer (1972) and concentrate primarily on the elements of Narrative Composition.

Analysis of Writing Samples

An examination of three writing samples reflect instruction and discussion directed to description of character and organization of story elements leading to the plot (See Table 1 for a summary evaluation). Early samples become anchor samples for later writing. As might be expected, the wide range of initial writing ability interacts with instruction to present varied individual patterns. Growth appears to be greater for less creative students who are adding new elements to their writing as a result of instruction. Internal logic remains strong throughout and supports the necessity for careful prewriting preparation. The areas of characterization and detail show increased attention in the second writing sample, which followed focused discussion on descriptive writing. Although sentence complexity and use of dialogue vary throughout as a function of individual ability and style, sentence coherence appears to be responsive to instruction.

Short writing periods limit a more detailed analysis at this time. Student writing is just beginning to show evidence of attention to theme; yet most of the children have discussed thematic aspects of their stories. The short initial samples do not lend themselves to more quantitative analysis of discourse elements, such as T-units, and verb density. Later elaborated samples, may reflect more accurately the continuum of writing growth when compared with earlier samples. Total patterns analyzed holistically over time will add validity to the current assessment of elements of composition.

Discussion

Preliminary assessment of writing samples appear to confirm the procedure of "Listen, Discuss, Write," as a means of fostering the growth of composition skills for the group described. Although greater improvement is shown for less able writers, good writers also appear to profit from targeted discussion of narrative elements. Comments from students reflect a greater awareness of character description in their own composition and in the literature selections chosen for pleasure reading. Requests for extended writing periods followed the outlining of story events and beginning sessions of elaborated writing.

Although the formal critiquing phase has not begun, students are spontaneously sharing ideas and giving each other suggestions, such as names for new characters and places, vocabulary substitutions, etc. Self evaluative comments are increasing and are directed to specific elements; for example, Kemp observed that he should change his main character from a sorceror to an emperor to be more consistent with the plot and events. Ida decided to rewrite her initial story, keeping the same idea but changing the setting and pattern of events to, "put the story in better order." Peter has concluded that he needs more historical and geographic accuracy in his story; consequently elaborated writing has been curtailed while some library research occurs.

As the sessions continue, students will engage in group interaction for purposes of revision. Spelling, grammar and transitional writing are not being analyzed at the moment because specific instruction will be directed to those aspects with attention again directed to the model. The focus of this study is on generation of ideas and on understanding narrative elements.

One recommendation for future replications of the study will be to include early attention to developing a "sense of audience." Kroll (1978) and Golden (1980) emphasize the need for experiences which help children to develop awareness of the audience to whom they are writing and to adjust a piece of writing to fit a particular audience. Questions such as, "Who is going to read your story," and "What will be most interesting to them," may give children a better sense of direction during initial writing stages. Interactive group responses also provide opportunities to create audience awareness in writing.

It is anticipated that the "Listen, Discuss, Write" approach will be one way to foster growth in children's writing ability in the middle grades. By combining successful strategies from the teaching of reading and the teaching of writing teachers can help students to grasp the view that communication processes are interrelated and exist in reciprocity to one another.

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Scoring Profile for Three Writing Samples

Score Values

1 = none
2 = little
3 = much

Sample I: Initial Writing — starter story

Sample II: Focus on character description

Sample III: Beginning Elaborated Writing

Table 1

	Originality			Plot Beginning			Internal Logic			Detail		
Kristen	2	2	2	3	2	2	2	3	3	2	1	1
Anne	3	2	2	2	2	2	3	3	3	2	2	2
Janice	1	2	2	2	2	3	2	3	3	2	3	1
Ida	2	2	2	2	2	3	1	2	3	1	3	3
Wayne	1	2	2	2	3	3	3	3	3	1	3	3
Peter	2	2	3	3	3	3	2	3	3	2	3	3
Blaise	2	2	3	2	2	3	3	3	3	3	3	3
Kemp	2	3		3	3		3	3		1	2	

THE EFFECT OF EXPOSURE TO SIMILES ON CHILDREN'S COMPREHENSION AND USE OF THE FORM

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Authors of great stories for children will not be bound by the constraints of vocabulary control or literality. Rather, they tell their tales with verve, precision and dash, leaving their young readers free to grasp what is meaningful. Witness Beatrix Potter's description of the attempt of some sympathetic birds to comfort the entrapped Peter Rabbit: ''A flock of friendly sparrows flew to him in great excitement and implored him to exert himself.'' Or this, from Rowena Bennett's *Motor Cars*: ''They look like burnished beetles, black. . .''

Indeed, this freedom from intellectual restraints, this mind-stretching quality has often been advanced as a reason for including the richly figurative materials of children's literature in the instructional programs of children.

The study reported here is an investigation into the abilities of elementary school children to deal with a particular form of figurative language, the simile, and to note changes in this ability as a result of regular, planned exposure to the form.

The study asked: (1) does regular, structured exposure to similes increase children's ability to process this form of figurative language? (2) What qualitative differences may be noted in children's responses to similes as a function of this exposure?

The subjects were children from four schools in urban Richmond, referred by their teachers for tutoring in reading. The tutoring was done by undergraduate students enrolled in a diagnostic reading course. The majority of the children were referred for remedial purposes, but 6 of them were referred for purposes of enrichment. The children ranged from kindergarten to fifth grade level. Twenty students were originally placed in the experimental group, but because of transfers only 17 students in this group remained for the duration of the study. Twenty students were to have comprised the control group, which received treatment between pre- and posttests, but for reasons beyond the control of the writer complete pretest and posttest scores were available for only 7 of the control group children.

The subjects (experimental and control) were given a 60-item test of similes constructed by the writer. The initial test was administered early in October at the outset of the tutorial session and administered again 8 weeks later. During the intervening 6 weeks the experimental subjects were presented with specially constructed similes practice materials at 2 tutorial sessions per week. The practice materials took no more than 5 minutes of the tutorial hour. For those children who were unable to read the test or the practice materials, the tutors read the items aloud and recorded the children's answers.

The similes test and the practice materials contained three types of items: multiple-choice, judgmental, and completion.

The first portion of the similes test was composed of 20 multiple-choice items, in which the children were asked to choose the best completing term. The second portion contained 20 items which the students were to judge as *silly* or *not silly*. The final 20 items required the children to supply the completing terms of the similes. Half of the items in each of pertinent information in mathematical problems is presented in pictorial form. What would the effect on student achievement be if pertinent information in mathematical problems were presented in pictorial form? It may be that when students are able to carry out the necessary computational procedures presenting "verbal" problems in pictorial representation will decrease the difficulty of the problems and increase the probability that students will solve them correctly.

More is known about students' sensitivity to the organizational features of verbal material. Bruning (1970) studied pupils' factual recall for passages with both pertinent and extraneous information. He found that recall was significantly greater for passages which featured only pertinent information. A series of studies (Brown & Smiley, 1977; Brown, Smiley, Day, Townsend, & Lawton, 1977; Brown & Smiley, 1978) has focussed on students' ability to extract the major points from verbal passages. Results indicate that the more mature processor is able to attend to the pertinent, or most informative material while the less able student finds difficulty in ignoring extraneous, or less informative sections of passages. The practical aspect of these findings for success in problem-solving is evident. Effective channeling of pertinent information and sensitivity to extraneous details in verbal problems can insure successful problem-solving, again assuming that the students have acquired the necessary computational ability for those problems (Arter & Clinton, 1974; Biegen, 1972; Blakenship & Lovitt, 1976; Faford, 1977). To date, we are not aware of any prior studies where the combined effects of representing verbal problems pictorially and featuring pertinent and/or extraneous information on problem-solving ability was investigated.

In general, the purpose of this study was to begin examining the effects of manipulating the representation and organizational features of the problems on the students' ability to solve them. Specifically, this study examined students' ability to solve mathematical percentage problems when they were presented either pictorially or verbally including pertinent-only or pertinent and extraneous information. Once the students who demonstrated ability to compute percentage problems were identified, the following questions were investigated. Would students solve percentage problems represented pictorially more successfully than the identical problems represented verbally? Would these students solve percentage problems featuring pertinent-only information more successfully than those featuring both pertinent and extraneous information? And finally, would the combination of representation and feature result in a hierarchy of difficulty for solving percentage problems?

METHOD

Subjects

Two hundred thirty-eight 10th through 12th-grade students enrolled in an Algebra I or II course at five public high schools in Lafayette, Louisiana, served as subjects for the study. These subjects were identified from a population of 732 by having demonstrated 80% or better on a screening test of percentage computational ability in a non-problem-solving format. Algebra I and II students were used as subjects in the study because, typically, percentages are assured to be mastered prior to entry into these courses and because problem-solving is usually stressed in Algebra.

Instruments

Data analyzed in this study were from student responses to items involving percentages on two instruments—a computational screening test and a problem-solving test. The computational instrument included 10 percentage items: one-half were the type "A% of B = ______" and the other half were they "B — (A% of B) = ______". These items involved only percentages less than or equal to 100%. They included no mixed percentages (i.e., no percentage numerals such as 56½ or 13.5%), and all items called for whole numeral answers. The order of the two types of items on the instrument was randomly assigned. Space was provided below each item for the students to show all their computations.

The problem-solving instrument included 10 items—two each in the following representations with these organizational features: (1) pictorial, pertinent-only information; (2) pictorial, pertinent and extraneous information; (3) verbal, pertinent-only information; and (4) verbal, pertinent and extraneous information. Eight different problem-solving situations involving percentages, four of the type A% of B = ______ and four of the type B — (A% of B) = ______, were devised to provide the basis for the items on the instrument. These eight problem-solving situations are briefly described below in Figure 1.

Figure 1

Problem-Solving Situations for Percentage Problems

A% of B Problems:

Item Number	Description
1	Determine the interest on money placed in a savings account
2	Determine the tax to be paid on a restaurant bill
3	Determine the amount of weight reduced on a diet
4	Determine the amount of cheese eaten by a mouse
	B—(A% of B) Problems:
5	Determine the length of jeans after a percentage of shrinkage
6	Determine length of board after a percentage of cutting
7	Determine liters of gas remaining after percentage used
8	Determine depth of lake after percentage of drop in water level

reading and writing using a guided writing procedure which "encompasses the four communication arts with a focus on the essential skill of writing." (p. 293). These two guides facilitate the development of comprehension and composition by providing clear directions about the tasks.

Objectives

Middle and secondary grade students in English and reading classes are often required to read and then to demonstrate their reading comprehension by writing activities such as book reports. Yet, many students do not understand how to process their reading and writing to produce effective reports. In this classroom application, two procedures were employed to facilitate guided comprehension. The major objectives were to provide students with clear tasks for problem solving, a procedure for writing compositions, and exposure to a classic adolescent novel within a limited time. "Read a book in an hour" (Smith, 1979) was the main procedure for the development of listening and reading comprehension. "Hamburger writing" (Beyer, 1977) was the procedure for the development of composition.

The Setting

The participants in the classroom technique were 22 seventh and eighth graders enrolled in a suburban middle school summer enrichment program. Since the program was only 4 weeks long, 5 mornings a week, and included students from several schools, both time and diagnostic information were limited. Students showed little interest in reading and said they had problems writing about what they read. The teacher introduced the technique as a possible solution. She suggested that the writing hint might be useful in their classwork next year as well.

Procedures

The novel selected was *A Day No Pigs Would Die*, which has high appeal to adolescents and contains short, action-packed chapters. The theme is mature but the writing style is fairly simple.

As the first step in the lesson, the teacher introduced the novel by reading the title, showing the class the book cover, and sharing how impressed and moved by the book she had been. (She did mention that the book contained some "strong" parts and "raw" language, which were not for emulation but necessary to depict this story setting.) She asked students to generate expectations about the book content and to share any experiences they had had which might be relevant to these expectations.

The second step was to read aloud to the class the first chapter. A whole class discussion of their predictions followed. Chapter content was discussed orally by identifying each of the following elements:

Setting	Main Idea	Major Supporting Details	Major Characters	Conflicts
Field	trying to help cow give birth	teased by schoolmates; got stickers in backside	Robert Peck Edward Thatcher cow/calf	Edward making fun; cow being born

Next, chapters 2 through 12 were assigned for silent reading, two students per chapter. Chapter 13 was assigned to a teacher; 14 and 15 were to be read by all participants after the sharing of 2 through 13. Each group was to read to identify the elements used during the listening portion of the lesson. The discussion in the small groups after chapter reading was lively. All students understood the task, although a few groups required assistance to identify some elements, such as conflict. In such cases, the teacher guided their re-reading of passages and encouraged students to think aloud after the re-reading; this guidance was similar to Olshavsky's use of protocol analysis.

On the second day of the lesson, groups shared their synopses of chapters by writing the identified elements on the board as they described each chapter.

As the fifth step, all students read chapters 14 and 15. The students then talked about their reactions to the book and to this manner of reading a book.

Sixth, "hamburger writing" was introduced by using a colorful poster of a hamburger and identifying: the top roll as topic sentence, the bottom roll as wrap up, the hamburger as the "meat" of the paragraph, and the condiments as the details and examples. Together the class identified the hamburger parts of this paragraph:

top roll	Michael skipped school
ketsup,	He told me he was going to do it.
lettuce	Sharon saw him outside playing.
meat	He got caught by the principal.
bottom roll	The principal called his parents.

Seventh, students were asked to write a composition using two hamburger paragraphs, describing *A Day No Pigs Would Die*. Some guiding questions were provided if they elected to use them:

paragraph 1 —	Respond to the activity of reading a book in an hour. Did you like the activity? What did you like best or least? Did it make you want to read the book?
paragraph 2 —	Describe your personal reaction to the book. Did you enjoy it? Why/Why not? Did it have special meaning to you?

Evaluation

This lesson was not intended to be research oriented; it was an application of professional literature to classroom experience. Therefore, evaluation was conducted informally by assessing the reactions of teacher and students, and by analyzing the compositions for use of hamburger paragraphs and for indications of comprehension.

Twenty students were present to complete the composition. Tabulations indicate that 18 of 20 students applied the hamburger paragraphs; 2 simply listed statements. Seventeen students demonstrated comprehension of the novel by providing a theme statement or an example from the book; 3 wrote such general comments that it was not possible to determine comprehension. Sixteen students expressed favorable reactions to the lesson; 4 were unfavorable, as demonstrated in the selected comments below. Eighteen students expressed favorable reactions to the book; one did not care for the book (see comments) and one expressed no opinion. Although only three mornings of class remained when this activity was completed, the teacher reported that five students read the complete book during that time.

Three compositions are reproduced, as drafted, to illustrate the lesson more fully:

> Tony:
>
> I like this activity because we could tell you what we thought the main ideas was and we could explain what we read. I would like to do it again.
>
> This activity was fun and interesting because Mr. Peck said that he would never again put a weasle in with a dog. Robert said that no pig would die on this day. I like what Robert said because he let no pig die on this day because his father died.
>
> Anthony:

A Day No Pigs Would Die

I did not like the activity because it did not have more action. If I could had read the book I would have enjoy it. But the activity did make me want to read the book.

I enjoy the book because it have more action. I would like read the whole book to get a good understand.

Kathleen:

I liked this activity because we learned about a new book. The way we did it everyone could learn about a book at the same time. The book made me want to read it. I liked the part about each person reading a chapter. I just loved the activity.

I would love to read the book. The part about when he got stickers in his privates was my favorite. I also like the part about the pervert. I just hope I get to read the whole book myself.

Selected comments are included to demonstrate varying reactions to the activity and to the book:

If I had read the book by myself, I wouldn't have finished it.
I really like the book. I wouldn't mind reading it.
I did not like the way we did the activity. I would prefer to read the whole book myself.
I wouldn't really want to read the book because it was sad and I don't like to read sad books.

The teacher was extremely pleased with the results. She felt that she had attained greater success than in other situations where she had assigned reading and writing activities. She has since used this lesson again with even greater satisfaction.

In the future, classroom research could be conducted to test the significance of this technique more objectively. Results of an assignment in which students have read a novel and then written a composition could be compared to results after read-a-book-in-an-hour and hamburger writing have occurred. In that way, the effects of guiding comprehension through listening to reading to writing activities, encouraging employment of effective comprehension strategies, could be measured.

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THE EFFECTS OF CONCRETENESS AND IMAGERY ON PAIRED-ASSOCIATE LEARNING AND RECALL IN THE READING PROCESS

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Much research has centered on the manner in which a variety of verbal attributes influence learning. One theory that has received attention, particularly in the area of reading and comprehension, is the ability of a verbal item to arouse an image. The term *concreteness* has been used to describe this attribute, and research reports that this variable makes a significant contribution to learning when placed on the stimulus side of a paired-associate task.

Evidence supports the contention that mental imagery training enhances paired-associate learning. The results of research studies (Pavio & Yuille, 1967; Wolff & Levin, 1972; Pressley & Levin, 1980) indicate that instructions to create mental images from words strongly facillites paired-associate learning. The results of Hall's (1971) study concur, stating that concrete imagery makes a more potent contribution to learning and recall than either meaningfullness or rote repetition.

Shepard (1978) defends the role of the mental image in human thought against critics who maintain that mental imagery is secondary or even peripheral to verbal thought processes; however, the value of mental imagery as a positive factor in reading comprehension is not well explored. Investigation with third through sixth grade readers found mental imagery instruction facillitated recall after prose reading (Kulhavy & Swenson, 1975; Rasco, Tennyson & Boutwell, 1975). Similar results were found for high school students and adults (Steingart & Glock, 1979; Anderson & Kulhavy, 1972). The Levin (1973) study with below average readers indicates that imagery study is effective with students who have average or better vocabulary skills.

Conflicting results are also found as to the type and extent of imagery training needed for students to profit from the use of mental imagery in reading connected discourse. A four week training program (Lesgold, McCormick & Golincoff, 1975) was successful in helping third and fourth-grade students recall more information; however, similar results were found with third graders after a 20 minute visual imagery program (Pressley, 1976). Other researchers (Kulhary & Swenson, 1975; Rasco, Tennyson & Boutwell, 1975) also found brief imagery instructions were sufficent to increase the reading comprehension of fourth through sixth grade average or above average readers. Levin (1973) found that below average fourth grade readers with average vocabulary scores benefitted from short imagery instructions while those with low vocabulary scores did not. In another case, brief imagery instruction did not improve the memory of fourth graders (Levin & Divine-Hawkins, 1974).

The results of reported research using brief imagery instruction were inconsistent; whereas; the reports using imagery training were successful. In view of these results it appears that imagery training may be an important factor in assisting some readers to comprehend more effectively. Particularly, below average readers may profit from this instruction.

The purpose of this study was to determine if a group of students learned, recalled, and answered correctly significantly more comprehension items when they were trained to "image" or make up pictures in their heads, than a group that was just instructed to remember the material "for later," but received no special training. Inherent in this study was the question of whether students learned pairs best when presented as pictures, concrete nouns, abstract nouns, or verbs.

Method

Measures

A paired-associate test adapted from Epstein, Rock, and Zuckerman (1960) was given to serve as an indication of the method by which students learned best — pictures, concrete nouns, abstract nouns, verbs. Comprehension pretest and posttest scores were acquired through the administration of the Iowa Tests of Basic Skills (Form 5, Level 10). These tests were administered to both groups under similar conditions and by the same administrator.

Subjects

The subjects of this study were 38 fourth year students who attended school in a rural, lower-middle income area in Georgia. The experimental group was comprised of 18 below average students who received 30 minutes of mental imagery exercises per day for a 9 week period. The comparison group was comprised of 20 average and below average students who spent 30 minutes per day with the same experimental materials but in the development of skills other than imagery. Both groups received this instruction from the lead reading teacher.

Treatment

After pretesting, two poems from a fourth grade supplementary reading book were presented to both groups, at different times, by the teacher. The poems, "Green Moth" by Winifred Welles and "Crows" by David McCord, were especially conducive to the development of sensory and mental images by the experimental group.

An opaque projector was used to project the poems onto a screen creating a focal point for the students' attention and allowing them to read along silently as the teacher read aloud. In each case, the students in the experimental group were encouraged to linger over the images created by the poet. Questions were used to spur group discussion.

In order to further facilitate those students in the experimental group in imaging what they read, descriptive paragraphs and corresponding pictures were cut out of various supplementary reading books on the fourth grade level. These paragraphs were glued onto poster-board and placed in a small box. Each student then picked a paragraph at randon, read and imaged the passage, and drew and colored what came to mind. Finally, the matching pictures were shown to the students for the purpose of noting similarities or differences in detail of the illustrators' renderings and their own.

In addition, the experimental group was encouraged to image those selections in their basal reading textbooks and studybooks that were suitable for this purpose, and the SRA Reading Laboratories also proved useful for special training and imaging of paragraphs read and answering comprehension questions.

As previously noted, the materials used with the comparison group were basically the same. The same poems were also presented to this group by means of the opaque projector, but literary form, rhyming pattern, and personification were discussed instead of mental imaging.

The comparison group was taught comprehension skills only as they occurred in the context of their normal reading instruction.

Analysis

Four null hypotheses were constructed which proposed no significant difference between the experimental and comparison groups on the four methods of presentation of the paired-associate test. The fifth null hypothesis proposed no significant difference in comprehension gain between the two groups. The hypotheses were tested at the .05 level.

Data for this study were obtained through the administration of the paired-associate test which was given only once, at the onset of the study, to determine the method by which the group learned best. Comprehension pretest and posttest scores were acquired through the administration of the Iowa Tests of Basic Skills (Form 5, Level 10).

A series of four t-tests were calculated to test the hypotheses for each of the four paired-associate tasks. The results of the t-test (Table 1) revealed that the experimental group scored significantly higher (.001) than the comparison group on the subtest in which pictures were presented as the stimulus. The t-values comparing the means of the subtests presenting concrete nouns, abstract nouns and verbs as stimuli indicated no significant difference.

Table 1

RESULTS OF t-TESTS FOR THE PAIRED-ASSOCIATE TASKS

GROUP	VAR.	n	X	SD	t	df
A	PICTURES	18	4.28	1.90		
B		20	2.40	1.05	3.82	36*
A	C. NOUNS	18	2.61	2.06		
B		20	3.10	2.20	.70	36
A	A. NOUNS	18	1.11	1.18		
B		20	1.00	1.17	.29	36
A	VERBS	18	1.00	1.19		
B		20	.95	1.15	.13	36

*P < .05

The comprehension subtests of the Iowa Tests of Basic Skills (Form 5, Level 10) was administered as pretest and posttest. The gain score was calculated and used as the dependent variable. Since it was necessary to use intact, homogenous groups, ANOCOVA was employed to statistically control the groups with the comprehension pretest score as the covariate. The F ratio of 9.27 (Table 2) indicated a significant difference at the .005 level. The adjusted mean gain score of the experimental group (.41) was significantly higher than that of the control group (-.27).

Table 2

ANALYSIS OF COVARIANCE WITH COMPREHENSION GAIN AS THE DEPENDENT VARIABLE AND COMPREHENSION PRETEST AS COVARIATE

Source of Variation	SS	df	MS	F
Covariate CPre	1.07	1	1.07	3.49
Main Effect Group	2.83	1	2.83	9.27
Residual	10.70	35	.31	....
Total	14.60	37	.39	....

$^{*}P < .05$

Conclusion

The experimental group receiving imagery training increased comprehension scores significantly more than the control group which did not receive imagery training. These results support the trend found the Levin (1973) study that below average students profit from imagery training. The positive findings and the results of Lesgold, McCormick, and Golincoff (1975) lend credence to the possibility that duration of the training is an important variable. The results point to need of additional research and to the possibility that rather simple but extended imagery training can assist the below average reader toward better comprehension.

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REPEATED READING OF TAPED LITERATURE: DOES IT MAKE A DIFFERENCE?

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Learning to read is an ominous task for culturally different students who may enter school with little preparation for understanding printed language. Their own language patterns bear little resemblance to the language of school and even less resemblance to the formal, concise language of print. Their exposure to books and their experience backgrounds are sharply limited. Their homes are characterized by an absence of printed material, and they have been denied one of the most valuable preparatory experiences for reading—that of having been read to. The challenge of understanding the relationship of language and print maybe quite beyond the capacity of some of these children.

Instructional programs for culturally different children, who often comprise a large proportion of remedial programs, do focus on language development in the early primary grades, along with a heavy emphasis on decoding skills. As language and decoding skills develop, ample practice in the use of these skills is essential if they are to become a solid foundation for fluent silent reading. Unfortunately, little time is available in remedial programs for the act of reading itself, which would provide the much-needed practice.

If we consider reading comprehension to be dependent on general language comprehension (Perfetti & Goldman 1976), then, we must concentrate our efforts in remedial programs on techniques which will not only enhance language development, but at the same time foster an understanding of the relationship between language and print.

REVIEW

As a remedial technique for culturally different students, listening while reading serves as a basis for integrating language with print. The Neurological Impress Method (Heckleman 1969), which involves simultaneous reading by the student and teacher, and Assisted Reading (Hoskisson 1975), in which the child is read to after which he repeats back words, phrases, and sentences, are techniques which focus on the relationship between reading and language.

The two methods have provided a foundation for a number of remedial techniques which have been developed and successfully utilized during the last decade. Of particular benefit to culturally different students is the use of taped stories. This technique of taping not only offers exposure to literature and practice in the use of the skills, but it also compensates for time limitations.

The critical role of this multisensory technique for remedial students can be more clearly understood by examining the reading process. A series of visual, auditory, and cognitive skills and processes are required for the utilization of information during the act of reading. Fluency in reading is arrived at through the proper meshing of these skills and processes, which is precipitated by adequate practice in using them.

The stages of information processing are described by LaBerge and Samuels (1974) as related to their theory of automaticity and the acquisition of skills. Visual information is transformed through a series of processing stages involving the visual, phonological, and episodic memory systems until it is finally comprehended in the semantic system. The two criteria for evaluating the processing are *accuracy*, and *automaticity*. Accuracy is demonstrated through word recognition, phrasing, observation of punctuation, and absence of hesitations, repetitions, and omissions. Accuracy requires attention, thus, of necessity, it precedes automaticity.

When attention is no longer required for the processes of decoding from the visual to the semantic systems, automaticity has been achieved. In other words, reading is occurring automatically.

The importance of automaticity is emphasized by LaBerge and Samuesl (1974).

> It is this capability of automatic processing which we consider critical for the successful operation of multicomponent, complex skills such as reading. As visual words are processed through many stages en route to meaningfulness, each stage is processed automatically. In addition, the transitions from stage to stage must be automatic as well. Sometimes a stage may begin processing before an earlier one finishes its processing (p. 295).

Further enlightenment on the importance of automaticity has evolved from Farnham-Diggory and Gregg's investigation of short-term memory function in young readers. In good readers, memory scanning in both the auditory and visual modalities occurred at about the same speed, while in poor readers, the auditory scanning lagged behind the visual speed. This lack of synchronization is devastating to the reading process. Obviously, automaticity could not occur due to the asynchrony of the two modalities.

Attention to the act of decoding creates a barrier to comprehension until automaticity is reached. Repeated readings aid in overcoming this barrier by providing the practice that is needed for the word recognition skills to become automatic. This promotes the main purpose of repeated readings, which is building fluency (Samuels, 1979).

Several recent studies support the contention that repeated readings and reading while listening do aid in developing reading fluency. All of the studies involved the use of taped material which the students read along with as they listened.

In a four-year study using reading while listening, Schneeberg (1977) found the technique to be beneficial for educationally disadvantaged students. The students demonstrated gains of 1.0 to 1.2 while expected gains were 0.65 to 0.75.

Carbo (1978) also used the technique successfully with learning disabled students. The gain scores ranged from four months to fifteen months after a treatment period of only three months. The requirement of the use of the visual, aural, and tactile senses were cited as an advantage of the method.

Third grade students who were unable to apply their decoding skills to the printed page participated in a study conducted by Chomsky (1976) during which repeated readings of taped literature were utilized. The students "memorized" their stories using this method, which also had a positive effect on reading achievement scores.

Significant comprehension gains resulted from a thirteen week experimental study (Laffey, Kelly, & Perry, 1979) during which Title I students read aloud as they listened repeatedly to taped literature. This study differed from the previous ones in that the students had read along silently in the earlier studies.

Reading while listening provides a means of bridging the gap between the decoding and comprehension levels while providing practice in the use of the skills. Active participation on the part of students is required, yet it allows reading to be an enjoyable activity for students who may have experienced endless frustration during reading previously.

All of the researchers in the four studies mentioned observed significant changes in the students' attitudes toward reading. In addition, it was felt that the materials were highly motivational. Many of the students were experiencing reading success for the first time, which appeared to result in the development of self-confidence and enthusiasm for reading. Since negative attitudes, lack of confidence, and lack of enthusiasm are significant problems with poor readers, these changes were welcome.

The time limitations in remedial programs which deny practice in the use of the skills are compounded by prevalent attitudes and current practice regarding oral reading. It is not widely recognized as a vehicle to comprehension among educators, and is usually sharply curtailed in most school programs. (Durkin, 1978).

The importance of oral reading to comprehension was demonstrated by the Laffey et al study as well as recent results obtained by Negin and Rios (1980). In exploring the effects of oral and silent reading on the comprehension of disabled secondary readers, they found that comprehension scores were superior when either difficult or easy material was read orally than when the same material was read silently.

The study described in this paper was conducted to determine the effect of a year-long treatment program of repeated readings of taped literature on reading achievement of culturally different children. This is essentially a replication of the 13 week study (Laffey, *et al*) over a longer time period. The major difference between this study and the original was that it was considered desirable to compare the growth of students' reading achievement with benefit of the treatment to their growth for a comparable period without the treatment.

Essentially, they served as their own control group for this purpose. Their growth from one year without the treatment was compared to that of the following year, during which they received the treatment. The treatment this year, as well as other instructional activities, were part of the Title I reading program designed to supplement the basal program.

It was hypothesized that there were no statistically significant differences between the experimental and control groups on their (1) comprehension, and (2) total reading test scores when each is taken separately.

PROCEDURES

Subjects

Nine students from the 5th and 6th grades from a rural school in Rockingham County, Virginia, served as the subjects. They are characterized by low socio-economic status and language deficiencies, and could be described as culturally different. All were reading from 1½ to 2½ years below grade level, and were most decidedly reluctant readers.

The students were chosen for the study because, as a group, they experienced more difficulty with reading and the least growth on achievement test scores of any of the Title I students. Their scores showed poor comprehension gains and general weaknesses in phonics and structural analysis.

In addition, their independent oral reading was characterized by the use of poor expression, an inability to apply decoding skills in context, a failure to observe punctuation, and problems with speed. In most cases, the students exhibited auditory sequential memory items on the *Slosson Intelligence Test*, which incidentally placed the majority of the students in the slow learner range.

Analysis

The *California Achievement Test* was used as the pre- and post-test measure of comprehension and total reading. The experimental treatment consisted of listening while reading to the tapes, both silently and aloud, and this was supplemented with various comprehension activities.

Analysis of the data was carried out using correlated t tests. An alpha of .05 was selected for testing statistical significance.

Treatment

The treatment consisted of reading silently and orally while listening to taped literature along with a number of comprehension activities. The stories used in the study reflected a variety of topics: humor, folk tales, sports stories, biographies, fairy tales, legends, and adventure stories. They were chosen according to two criteria. Appropriate and appealing literature was selected for the purpose of enriching the students' backgrounds. In addition, they were chosen to reflect the expressed and observed interests of the students.

The stories ranged in reading level from 2nd to 5th grade. For the initiation of the treatment period, material which was below the students' instructional level was used. This served a dual purpose. Many of the students were unable to read even relatively easy material with expression so it did present a challenge. It was felt that this material would allow for ease in decoding and maximize the importance of expression. In addition, the researchers wanted the initial experiences with the technique to be success-oriented.

The stories were taped by the researcher with whom the students were not familiar. This was due to the fact that the students heard the teacher's voice on a daily basis for routine procedures, so it was decided that an unfamiliar voice would be preferable.

A carefully prepared orientation program preceded the treatment. The students were given an explanation of the reasons for keeping their place as they read—seeing and hearing the words simultaneously. This was followed by a discussion of the reasons for using a marker. Finally, a demonstration of use of the read along material was presented.

The students spent 10 minutes a day listening to the taped stories. After listening twice, they were encouraged to read aloud with the tape as they listened. This was repeated 2 to 6 times until they could read the story fluently. Eight of the 9 students demonstrated the need to use a marker for the reading.

After the students felt that they had mastered a story, they were given the option of reading it to the teacher, the group, their classroom reading group, or another class in the school. Several read often to younger classes in the school. These same students rarely read aloud willingly to anyone prior to the treatment.

The materials used to supplement the taped stories included oral discussions, re-telling of the stories, oral comparisons with different versions of the stories, written questions, sequences, descriptions, and creative writing. These activities served as a means of promoting and evaluating comprehension, as well as creating an interaction between the printed materials and language.

RESULTS

Data analysis using a correlated t test revealed the following: $t\ (8) = 3.00$; $p < .05$. Thus the hypothesis of no significant differences for the comprehension achievement gain scores was rejected.

There was also a significant difference for the total test gain scores: ($t\ (8) = 2.92$; $p < .05$. Thus, the hypothesis of no significant differences for total test gain scores was also rejected.

DISCUSSION

These results, along with the earlier results reported in the literature review, seems to clearly indicate that oral reading, which is promoted by repeated readings of taped literature, plays a far more significant role in silent reading success than was formerly thought. Not only did the students in this study make significant achievement gains in comprehension, but many of the students demonstrated a noticeable increase in phonics and structural analysis scores which were reflected in the total reading test scores.

Also, it should be noted that for students with perceptual problems, the listen and read technique is particularly advantageous in that it utilizes a multisensory approach. The benefits from the use of the tape recorder are widely recognized for students with auditory problems. Visual perception difficulties are also aided by the simultaneous auditory reinforcement as the visual image is received.

In addition, many students with reading deficiencies exhibit eye movement problems, such as pursuit, focusing, or saccadic movement, resulting in finger pointing, which inhibits fluency. The listen and read technique provides an opportunity for training children to use markers in a controlled situation.

Possibly one of the most important dimensions of the study related to the affective changes that were noticed throughout the study. In fact, anecodotal records which were kept illustrate dramatic changes in the student's attitudes toward reading. For instance, many students spent additional time in the reading room during their free time and they requested more time so that they could listen more often. Several shy children demonstrated a welcome development of self-confidence in their reading ability and read regularly to different classes in the school. Many students started to volunteer to read orally in their classrooms which they had been reluctant to do previously. Enthusiasm for the materials was expressed in many ways. Near the end of the year, all of the students participated in a program of reading drama which was prepared for using repeated readings, and in some cases taped materials. For several, it was the first stage production they had been willing to perform in. The positive response of the student body, along with the students' pleasure from their performances, has spurred them to take the initiative for planning a more elaborate production for this year.

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THE ROLE OF SINGLE-WORD DECODING SKILL ON LITERAL AND INFERENTIAL CONTEXTUAL COMPREHENSION PERFORMANCE

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The effects of single-word decoding practice on reading comprehension of poor readers has been studied in the classroom and laboratory by educational theorists, researchers and practitioners with equivocal results. Some (Otterman, 1955; Jackson & Dizney, 1963; Goodman, 1965; Tuinman & Brady, 1973; Duncan, 1974; D'abre, 1977; Hughes, 1977; Kowal, 1977; Allington, 1978; Fleisher, Jenkins & Pany, 1979) argue that with most readers, decoding training does little to guarantee any appreciable improvement in reading comprehension.

Others (Langer, 1965; Bleyer, 1970; Sherk & Liebert, 1978; Blanchard, 1980) maintain that certain forms of single-word decoding instruction with most readers can facilitate reading comprehension. Singer, Samuels, and Spiroff (1974) and Ehri and Wilce (1980) seem to support this point. Ehri et al. (1980) suggests that cost-benefit considerations exist, both for introducing words in isolation and in context. Each offers unique advantages and disadvantages. Singer et al. (1974) seems to corroborate and finds that the best instructional practice is to provide both words in isolation and context training to facilitate comprehension. The question arises though, what about those disabled readers who have not yet learned to benefit from contextual cues and for whom decoding skills are a necessary first step to contextual awareness?

This present study investigated the feasibility of enhancing literal and inferential comprehension in disabled sixth graders through single-word decoding training before the readers encountered the words in context. The study was carried out under the following circumstances: (1) atypical sixth grade readers (poor and very poor readers); (2) single-word decoding training without a meaning emphasis; (3) complete identification and pronunciation mastery of all the words the pupils read (both passages and questions); (4) measurement of literal and inferential comprehension through multiple choice, four distractor questions; (5) four, one to one (proctor and pupil) experimental sessions.

The major research questions were: (1) Will single-word decoding training leading to pronunciation mastery of words about to be read both in a passage and the accompanying comprehension questions, facilitate poor and very poor sixth grade readers' ability to answer literal and inferential comprehension questions about the passage? (2) Can a single-word decoding procedure that does not teach word meanings but instead brings about the correct pronunciation of words in isolation, be an effective instructional tool in facilitating or enhancing literal and inferential reading comprehension? The premise underlying the last question is that oral language can be an instructional link to print (Brown, 1958; Durkin, 1966, 1970; Mackworth, 1972). Over a decade ago, in a seminal investigation, Wiener and Cromer (1967) postulated a theoretical framework for empirically testing both research questions:

> Comprehension which refers to the addition of some form of meaning associated with identification . . . can occur and be examined at any point at which identification can occur, once the visual forms are transformed to auditory forms, there is a possibility of comprehension given the presence of appropriate language skills. (p. 638)

METHOD

Subjects

Ninety sixth grade pupils were randomly selected from a population of approximately 120 sixth grade disabled readers. The readers' total reading achievement grade placement levels on the California Achievement Tests (CAT) were at least 1.5 years behind chronological grade placement. The Peabody Picture Vocabulary Test (PPVT) was administered as a covariate. All readers were ranked by IQ scores and then randomly divided into three groups by alternation: control, non-content-specific (NCS), content-specific (CS). The top 15 readers in each group of 30 were designated poor readers and the bottom 15, very poor readers.

The mean PPVT IQ scores and CAT grade placement data for the poor reader groups were: 84 and 4.1 (control), 83 and 4.2 (NCS), and 4 and 4.2 (CS). For the very poor reader groups, the scores and data were: 68 and 2.6 (control), 70 and 2.9 (NCS) and 71 and 2.6 (CS).

Decoding Training

For the purposes of this study, single-word decoding training involved a proctor pronunciation and pupil echo procedure. CS pupils were asked to identify flash cards (1½" x 2½", primary type) representing words from the passage and questions they were about to read. If they correctly identified a word by pronouncing it within two seconds, the next flash card was presented. If the pupil did not pronounce a word correctly within two seconds, the proctor pronounced the word and asked the pupil to echo that pronunciation. The word was presented later, but never without some intervening single word instruction or rehearsal. If necessary, the word was presented several times. It should be emphasized that neither of the three groups received contextual help for a word in the form of a definition or an example of its usage in sentence or phrase context.

NCS pupils were asked to identify flash card words from passages equal to those of the CS group in readability (fifth grade) (Fry, 1968) and structure (third person narrative prose, approximately 120 words in length) but never a part of the passages and questions they read as the comprehension criteria.

Control pupils received no training, they were merely given the passages (one at a time) to read and asked to answer the questions as best they could.

Comprehension Criteria

All pupils in the study read four passages from the *McCall-Crabbs Standard Test Lessons in Reading, Booklet A*. For each of the 4 passages there were 10 author-designed or adapted four-choice questions. Four questions measured inferential comprehension and 6 literal comprehension according to the following definitions: *Literal comprehension*—any question with the purpose of eliciting from the pupil a response which can be found explicitly stated in the written material, *Inferential comprehension*—any question with the purpose of eliciting from the pupil a response which is not explicitly stated in the written material. Pupils answered 24 literal and 16 inferential questions for the study. Test-retest reliability coefficients for the four sets of passages and questions averaged .65 and content validity was determined by a validation panel of reading specialists and two pilot studies.

Procedure

CS pupils, each day for four days, were presented on a one-to-one basis, a deck of flash cards by a trained parent-volunteer proctor. The passages (which included the appropriate questions and flash card deck) were randomly assigned to the pupils daily. Each flash card deck represented *all* the words the pupils were about to read. There was a flash card deck for each passage and its questions. The average number of flash cards in each deck was 81. Each card in a deck was presented for two seconds. If the word was identified and pronounced correctly, the next card was presented. If not, the proctor pronounced the word and the pupil echoed it. Pupils had to correctly identify and pronounce *all* words regardless of the number of presentations. To control for uniqueness of presentation on the unrecognized words, the minimum number of flash card words presented in a deck was 10. For example, if a pupil was unable to identify or pronounce 5 words on the first presentation of a flash card deck, on the next presentation the 5 words would be presented again but "shuffled" in with 5 known words and randomly presented. The pupils then read the passage and answered the comprehension questions (without the passage present).

NCS pupils followed the same procedures except the flash card words presented each day *never* appeared on any of the four passages and accompanying questions they read. In addition, since CS pupils could identify and pronounce all the words they might encounter, NCS as well as control pupils were allowed to ask the proctors to pronounce any word they had a question about, to hopefully reduce biasing the results in favor of the CS pupils. Each of the flash decks contained 81 words and the sources of the words in each deck were other *McCall-Crabbs Standard Test Lessons in Reading, Booklet A* passages and questions of fifth grade readability, which included words not present in the passages and questions the NCS pupils read for the study.

Statistical Analysis

Three, 2 X 3 (ANCOVA) factorial analyses of covariance (PPVT-covariate) were used. The dependent measure in one ANCOVA was the number of literal comprehension questions answered correctly, another used the number of inferential comprehension questions answered correctly, and a third used the total number of comprehension questions answered correctly. Independent variables for the designs were group membership (control, NCS, CS) and level of reading achievement on the CAT (poor and very poor). Computations were accomplished using The Statistical Package for the Social Sciences (Nie, 1975) system of computer programs. The specific programs were analysis of variance and covariance, sub-program ANOVA, and default option.

RESULTS

Literal Comprehension

According to the data, reading achievement level and group membership did not have a statistically significant affect on the number of literal comprehension questions answered correctly, nor was the interaction statistically significant.

Inferential Comprehension

The data for inferential comprehension performance was somewhat different than that of literal comprehension performance. The main effects of reading achievement level $F(1,83) = 7.62$, $p = .007$ and group membership $F(2,83) = 4.01$, $p = .021$, each had a statistically significant affect on inferential comprehension performance. A moderate to small effect of size (Cohen, 1969) was found for both independent variables: eta of .29 and .30 for level and group, respectively. The interaction was not statistically significant. Approximately 8% of the variability in inferential comprehension performance can be explained as attributed to each of the independent variables. In addition, Duncan's New Multiple Range Test (Edwards, 1972) was used to determine the means between which significant differences existed on the group membership variable. It was found that the CS group significantly ($p < .05$) out-performed both its counterparts. They ($\bar{x} = 15.72$) differed significantly from the control ($\bar{x} = 13.95$) and NCS ($\bar{x} = 12.25$) readers. The test results also revealed that the NCS group differed significantly from the control readers.

Total Comprehension

Only the main effect of reading achievement level had a statistically significant affect on total reading comprehension performance: $F(1.83) = 6.30$, $p = .014$. A moderate to small effect of size was found, eta = .26. As was the case with inferential comprehension performance, approximately 8% of the variability in total reading comprehension performance can be explained as due to achievement level of the readers. The group membership X reading achievement level interaction was statistically significant ($p = .03$). Reading achievement level and group membership interacted in an ordinal manner to affect total reading comprehension performance. Approximately 8% of the variance in total comprehension achievement can be accounted for by knowing simultaneously a reader's reading achievement level and group membership. The Duncan's Test ($p < .05$) was used to determine whether the total comprehension performance mean differences under the two levels of reading achievement differed from each other for the three groups in the study. It was found that the CS and NCS groups did not differ significantly from the other groups but that the control groups differed significantly from the other groups. It is also important to note that the very poor readers in the CS ($\bar{x} = 20.60$) and NCS ($\bar{x} = 17.95$) groups out-performed their control ($\bar{x} = 16.10$) counterparts; but, such was not the case with the poor readers. Control group poor readers ($\bar{x} = 24.25$) answered more comprehension questions correctly than did both the CS ($\bar{x} = 22.67$) and NCS ($\bar{x} = 19.87$) groups of poor readers.

DISCUSSION

The present study sought to determine if literal and inferential comprehension performance in sixth grade disabled readers could be enhanced by a procedure which ensured single-word decoding mastery of all the words to be read. It appears that literal comprehension amongst poor readers cannot be enhanced to any great degree but just the reverse is true with very poor readers. As a matter of fact, there was an increase in literal comprehension performance of approximately 12% in very poor readers. This represents approximately three more comprehension questions answered correctly by the CS group as opposed to the control group. Unfortunately, the inability of the procedure to change literal comprehension performance when it came to poor readers probably outweighed the gains made by the very poor readers when total reading comprehension data was analyzed. What is unexpected about literal comprehension data—is why the loss of the main effect for reading achievement? Did the CS very poor readers benefit from the procedure to point that their literal comprehension performance basically equalled that of the poor readers—despite the inherent differences in reading achievement levels? The answer seems to be yes. Interestingly enough, the NCS very poor readers ($\bar{x} = 12.07$) seem to have profited from decoding training which was not even content specific when compared to the control group ($\bar{x} = 10.80$).

Turning to a discussion of inferential comprehension performance, the same pattern established with literal comprehension, exists. Poor readers did not benefit; very poor readers did. The main effect for reading achievement level returned from its absence on literal comprehension performance. Poor readers ($\bar{x} = 7.97$) out-performed very poor readers ($\bar{x} = 6.01$). While this might signal that higher order comprehension processes are not quite so amenable to change through a decoding procedure; this is probably only true for poor readers since CS very poor readers did answer correctly approximately twelve percent more inferential comprehension questions than the control group. This represents approximately two more comprehension questions answered correctly. Thus, instructionally it can be anticipated that very poor readers will probably increase their inferential comprehension more through the study's procedures than poor readers.

The findings concerning total reading comprehension performance, as an amalgamation of literal and inferential comprehension, indicates that the main effect for reading achievement level is statistically significant. Despite the earlier concern over a lack of literal comprehension main effect; the inferential comprehension main effect was powerful enough to cause a significant overall comprehension main effect. This is to be expected since the variable itself (reading achievement level) served as a grouping criterion for the readers in the study. There was no main effect for group membership; but, the group membership X reading achievement level interaction was statistically significant. According to the interaction, control poor readers out-performed NCS and CS readers. It thus seems that for total comprehension performance in poor readers the procedure not only did *not* enhance or facilitate comprehension performance it might even *hinder it*. On the other hand, for those readers who have reading achievement grade placement levels at least a year and one-half below the reading difficulty of the materials to be read (i.e., very poor readers in the study) the procedure seems to help literal and inferential comprehension performance. This seems the case for several reasons: (1) lack of a main effect for reading achievement levels on literal comprehension performance; (2) mean differences between control and CS very poor readers on literal comprehension performance; (3) a significant main effect for group membership on inferential comprehension; (4) mean differences between control and CS very poor readers on inferential comprehension; and (5) a significant interaction on total reading comprehension showing the CS very poor readers significantly out-performing control very poor readers.

In conclusion, it seems possible to experimentally enhance improved literal and inferential comprehension in very poor readers using only their oral and listening language backgrounds as "starting points." Since the study's single-word decoding training avoided a meaning emphasis it would seem that when very poor readers can correctly identify and pronounce a word familiar to their oral and listening language backgrounds they have at least one correct meaning in mind for that word. In addition, it would appear that very poor readers have more potential for improved literal and inferential comprehension than might be expected. In all probability their reading comprehension potential is seriously under-estimated. This would seem the case since a relatively simple decoding procedure improved their reading comprehension. It should be remembered, though, that this simple procedure had two unique characteristics which might have contributed to its success: (1) complete decoding mastery of all words to be read in both the passages and questions, and (2) four individual experimental sessions for each reader.

Notwithstanding the optimism surrounding the procedure with very poor readers, it seems to pay no instructional dividends when it comes to enhancing comprehension in poor readers. Consequently, it seems possible to conclude that single-word decoding training does not enhance comprehension in all categories of disabled readers. This historical dichotomy between those who support and those who do not support the positive effects of single-word decoding training might take a step towards resolution if methodological considerations are given to the differences between the reading achievement levels of the students and the reading difficulty of the materials to be read, complete decoding mastery of both passages and questions and more than one experimental session.

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THE SPACE TEST AS A POSSIBLE NEW INFORMAL READING PLACEMENT TEST

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Competent readers attempting to gain information from the printed page engage in a "guessing game" in which the material that they have already read and the material that they expect to read facilitates the identification of upcoming words (Goodman, 1976). This contextual characteristic is also an important component of Smith's (1978) information processing model. According to this model, word identification is possible when the use of context by a reader reduces the number of possibilities for what that word might be.

Klein and Klein (1972) in trying to determine the effect of context utilization on word identification decisions made by readers of different ages, developed a technique which asks students to mark slashes between the words in the context of a passage. Some of the early research in the area of word boundaries provided some evidence of a possible relationship between ability to mark word boundaries and reading performance among very young readers (Mickish, 1974; McNinch, 1974). Other studies (Klein & Klein, 1972; Klein & Klein, 1973; Klein, Klein, & Doris, 1973; Klein, Klein, & Bertino, 1974) indicated that readers of different ages responded differentially to the word boundary-type tasks at the various grade levels and that the ability to use contextual information might be developmental in nature.

Two more recent studies supported earlier findings and offered interesting avenues for further research. Hecker (1978) found evidence that: (1) performance on a word boundary task was associated with grade placement level and level of reading acquisition of students; and that (2) word boundary-type tasks correlated highly with cloze procedure tests, suggesting that they might measure similar traits. Hecker and Jerrolds (1979) found support for the hypothesis that a space test, a special format for a written passage based on word boundaries research (see Figure 1), could serve as an informal measure of reading in much the same way as the cloze procedure functions. Since the space test can be completed within a few minutes, it would offer an alternative to teachers who are usually concerned about the time taken by the various classroom tests. Further, it should be noted that the present researchers and other teachers have noted that some children are resistant to, and others frustrated by, the cloze technique. Apparently these problems arise because the format for the cloze technique is such that those taking the test realize that for many cases there is no possibility beyond the wildest chance that they can get the right word. With the space test there are sufficient data to make it possible to get any or all words right. On the cloze test children are sometimes upset because they cannot tell how well they are doing. The space test provides better opportunities for self-monitoring as the students proceed with the test. Thus, the possibility of using a space test as a measure of reading performance in addition to, or instead of, the cloze test was further explored in the present study.

This study was designed to investigate further the validity of using a space test measure of reading comprehension. Specifically, the purposes of this investigation were: (1) to compare performance of students (at different grade placement levels) on a space test to their performance on a cloze procedure measure; and (2) to suggest acceptable scores for the space test as a placement test.

METHOD

Seven hundred sixteen 3rd, 4th, 5th, and 6th grade students from a South Carolina rural school were initially involved in this study. The students at each grade level were asked to complete space tests written at their grade placement reading levels and to complete cloze procedures which were made from the same passages.

During an inservice training session held by the researchers, the subjects' teachers were informed of the purposes for the

FIGURE 1

Example of space test format used in this study.

whileshetriesnottopl

ayfavoritesthenurses

claimthedoginstincti

velyknowswhenonechil

disextremelydepresse

dorsickwhenthisoccur

sshewillspendthenigh

tattheyoungstersbeds

study and trained in the administration of the tests. Written directions were left with the teachers who then administered the tests. Scoring was done by the researchers.

In order to minimize the possibility of ordering effects, the teachers at each grade level were randomly assigned to a "space first" or "cloze first" testing session. The second testing session took place one week after the first one.

The space tests and cloze procedures were constructed from four stories appearing in the basal reader materials used for instruction in the school where data were collected. Two readability formulas had to place the passages at the designated levels. Fry's (1968) readability graph was used for all four passages. In addition, the Spache readability formula (1958) was also used for the third level passage and the Dale-Chall formula for predicting readability (1948) was used for passages written at the 4th, 5th, and 6th grade levels. The passages from which the tests were made contained approximately 250 words each. The scoring procedure for the space test was the number of words that were correctly set aside by slashes out of the total number of words in the passage. The students were allowed two minutes to complete each level of the space test.

An every fifth word deletion pattern was used on each cloze procedure passage as recommended by Bormuth (1968). This resulted in 47, 45, 46, and 46 deletions for the passages written at the 3rd, 4th, 5th, and 6th grade levels, respectively. The total cloze score per passage was the number of exact words from the original text that were replaced by the student as recommended by Taylor (1953). The cloze procedures were administered under untimed conditions.

At each grade level, the raw cloze procedure scores were correlated with the raw space scores at the same grade level. Regression equations were then used for each grade level to predict a student's raw space score given a raw score on the cloze test that was equal to 38%. This was based on Bormuth's (1967) finding that a student could be instructed in materials in which he received a cloze score of 38%.

Correct raw space and cloze procedure scores were converted to percentages, and means of percent correct scores were calculated for each grade level. Data representing one classroom in grade four and one classroom in grade five were eliminated from the analyses of grades four and five, respectively, due to the large number of students who obtained scores equal to zero on those passages. It was reasoned that the teachers of these students did not sufficiently explain the task that the students were to perform. The total number of students included in these analyses was 666.

RESULTS

The results of the regression analyses are presented in Table 1. The correlations between the raw scores on the space and the cloze procedure tests were .63, .73, .63, and .52 for grades 3, 4, 5, and 6, respectively. These correlations were all significant at the .01 level.

The regression equations used to predict the space percent correct score equal to 38% correct in the cloze test yielded scores of 41%, 38%, 43%, and 40% for grades 3, 4, 5, and 6, respectively. As expected by the researchers, the means of percent correct scores on the cloze procedures calculated at each grade level were less than the 38% recommended by Bormuth (1967), indicating that the students in the sample were reading below grade level.

DISCUSSION

The results of this study support the hypothesis that a space test could, with further validity and reliability research, serve as a measure of reading performance in addition to, or instead of, the cloze test. The correlation values are indicative that the two measures assess similar traits.

From the data presented in this study the authors are currently recommending that a space test score of 40% correct is approximately the same as a score of 38% on the cloze test. The data further suggest that a student is probably reading below his grade placement level if his space test score on a passage written at that grade reading level is below 40%.

It should also be noted that some students in the sample could not complete the cloze passages written at their grade placement levels. However, these same students managed to partially complete the space test even though the corresponding scores were generally low. This conclusion supports observations reported in an earlier study. Hecker and Jerrolds (1979) found that while students seem to enjoy completing the space test, the completion of the cloze procedure was a frustrating experience for many of them.

FIGURE 2

An example of a correct word scoring for a space passage (score = 14).

while/she/tries/no/tto/pl

ay/favor/it/es/the/nurses/

claim/the/dog/in/st/in/cti

vely/knows/when/one/chil

d/is/extre/mely/de/press/e

dorsickwhenthisoccur

sshewillspendthenigh

tattheyoungstersbeds

TABLE 1

Correlations between Raw Scores on the Cloze and Space Tests, Mean Percents Correct, and Predicted Space Percent Equivalent to 38% on Cloze for Grades 3 through 6

Grade	Number of Students	Correlation Raw Scores on Cloze & Space	Mean Percent Cloze	Mean Percent Space	Space Percent Correct that Equals 38% of Cloze
3	101	.63*	16.09	29.24	40.55
4	219	.73*	26.56	31.95	38.22
5	144	.63*	28.52	37.64	42.51
6	202	.52*	23.47	33.98	40.48
Total	666				

*Significant at .01 level

While this study adds more insight into the possibility of using a space test as a measure of reading performance, some questions require further investigation. The authors are presently in the process of analyzing the data for order effects, possible interactions, and correlations with other measures of reading achievement. Additional research, however, needs to be done concerning the reliability and validity of the space test with the performance of children from other school settings.

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REACTION: THE SPACE TEST AS AN INFORMAL READING TEST

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My reaction to the present paper has to perforce be influenced by my current teaching activities. Presently I am a Title I Reading teacher whose students have scored in the area of stanines 1-3 on reading achievement tests and who could be described euphuistically as educationally resistant.

My own in-class experience with the cloze technique as a teaching and test tool has engendered negative responses on the part of my students to the point where they simply will not do it.

After being charged with the responsibility of reacting to the Hecker, Jerrolds, and Benton paper, and out of curiosity, I had a space exercise typed up and run off for use in my resistant classes. I gave it to my classes just to test their reaction to the "new" process. It was considered by the students as fun, sporty, and "do-able."

On the space test contrived for my class, the better readers appeared to score well and the less able readers appeared to score less well. There appeared to be a sufficiently high enough correlation to warrant that further study be made in this area; particularly in view of the fact that the space test exercise is so palatable and well received by the students.

Perhaps one reason why a space test has an advantage over the traditional cloze test procedure is that all the information is before the student; all he has to do is "fiddle" around with it. Conversely, with the cloze procedure the student has to "pull" information out of his head. For underachievers and resistant students the needed information is not always so readily available as it appears that they often lack the ability to generate or to recall it.

I would recommend the authors push forward in this area of evaluation. It is classroom oriented and eminently worthwhile as it offers a relevant alternative to more traditional evaluation forms.

COMPREHENSION AND THE LOGICAL RELATIONSHIPS FOUND IN WRITING

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One of the common elements found among humans is the quest to understand the order and structure of the world about them, the nature of things as they are: a relationship to external nature, the spiritual world, society, and his or relationship to self.

These relationships are most important because without them we cannot acquire the fullness of our nature. First of all, as humans we observe and experience, that is, we see or sense through the careful application of the mind and we become designedly aware of reality. This seeing or sensing, coupled with awareness, gives us information. Next, we relate, that is, we establish a connection between what we see or sense and become aware of *now* and the observations and experiences we have had in the *past* and we come to certain conclusions or judgments. Therefore, making relationships is key to the understanding of and determining the significance of the various aspects of reality which we observe and experience.

Another part of our nature is that of *sharing*, that is, communicating our understanding of some aspect of reality, our observations and/or experiences, etc., to others. In the case of sharing or communicating we are revealing our understanding of our relationship to the spiritual world, external nature, society or ourselves. We use the oral and written word to share, communicate or report these relationships. To be effective in our sharing we must precisely use words. We must also use words in some kind of logical order. Words are sound or written symbols of the *things* we encounter (feel, taste, touch, hear, smell, see, and observe to move) and our relationship to them every moment of our lives. We observe, experience, and share our relationships to ourselves, to others in society, to objects in nature, to concepts of a spiritual world. Words, oral or written, placed in a logical order are the means of that sharing. Words that suggest weight and/or volume, objects that are perceivable by the senses are M words because they symbolize objects in matter. Words that suggest relationships between objects and reveal time, space, amount, and quality are R words. For example, dog, cat, man, woman, boy, girl, rock, and rain are M words because they suggest things that have weight and volume; in, on, at, with, run, walk, slip, brave, three, and ten are R words because they reveal relationships in some aspect of time, space, amount, or quality.

To be effective a communication (C) depends upon the communicator's and receiver's personal awareness and experience (E). The clarity and effectiveness of a communication depends upon the participant's depth of perception as they experience self, society, objects in nature, and the spiritual world and make essential relationships. We must always bear in mind that without relationships there is no understanding; there is only information. Perception and experience vary from person to person, namely, individual differences. Thus we can say that experiences (E) are variable (v). No person, part of a group, seeing an occurrence reports it in the same way.

We can place what has been said about matter, relationships and experiences in a formula which will represent all communication.

$$C = \frac{M - M + R}{E(v)}$$

Take, for example, the following communications:

R M R R R R M
The book is on the new table.

The = R = deals with amount
book = M = suggests weight and volume
is = R = *deals with time*
on = R = deals with space
the = R = deals with amount
new = R = deals with quality
table = M = suggests weight and volume

Word Groups or Classes

Specific words are parts of a group, that is, they suggest related objects that have certain attributes, quality, and degree in common. This is especially true of M words. For example:

ship =
boat =
yacht =
punt =
canoe =
kayak =

All of these words are related because they have some thing in common, namely, each word suggests some quality and degree of *water travel.*

Contrasts

Just as words have something in common, the same words can suggest differences. These differences are called "contrasts." For example: although a ship and a kayak have something *in common*, namely, they suggest some quality and degree of water travel, the ship is certainly *unlike* the kayak in size, propulsion, and freight or passenger space. Thus a ship and a kayak are *contrasted*, that is they have certain characteristics that are unlike. Although a dining room table and a card table have something *in common*, some degree and quality of table, they are *unlike* in size and general purpose. Thus a dining room table and a card table may be contrasted.

For example:

A hare moves *quickly*, a tortoise moves *slowly*.

Abstract Words

The abstract word is an R word. It refers to the quality or state of being of an individual in relation to other beings. Notice that in the following sentence the quality or state of being can be determined only by appearance, status, or action. Note the italicized words.

Fear is an enemy of man.

Word Groups

Certain groups of words may be considered to be a single M word. These words in a group refer to single persons or things. For example: Mr. John Doe, City Drygood Store, United States Merchant Marine Academy.

Sentences

A sentence is a group of words that express logical or orderly relationship. For example:

M R R M R R M
He hit the ball into the stands.

He is related to "ball" through the R word "hit."

"Ball" is related to "stands" through the R word "into."

We can indicate these relationships as follows:

M R
He .... Ball + hit

M R
Ball........... .... stands + into

Paragraphs

The paragraph develops and clarifies by making relationships concerning what is being talked about in it. To put it another way, that which is being talked about is either the prime M or R. Notice the following paragraph.

The New Nation

> The new nation now had all the problems that beset one in the process of growing up. The Colonies, now States unified under a national constitution, gradually fell into two camps. Alexander Hamilton favored the interests of the Northern mercantile group, whereas Thomas Jefferson favored interest of the Southern planters. Unfortunately, these two interests influenced the American political, economic, and social outlook until the situation culminated in the tragedy of the Civil War.

This is the first paragraph in the short composition "The New Nation." What is being talked about in this paragraph is the New Nation (M^p) and its problem (R^p). The essential relationship being developed in this paragraph concerning the New Nation and its problems is that the situation (two camps conditioned American political, economic and social outlooks) culminated in the horror of the Civil War.

In all paragraphs, whether they be short or long, there is some sort of development and clarification by making relationships concerning that which is being talked about, namely, the M^p or R^p. Let us review the paragraph presented.

New Nation (R^p) .... problems (R)

States (R)............................... two camps (R)

two camps (R)
a. Hamilton (M) a. North mercantile interests (R)
b. Jefferson (M) b. Southern planters (R)

New Nation (R^p) .... Civil War (R)

Notice that in this paragraph we are dealing almost entirely with R words. This, of course, can happen because we, at times, talk entirely about *time, space, amount* or *quality* in an exclusive manner. Thus in the paragraph, as well as in the sentence, we can talk about things represented by either matter (M) or relationship (R) words.

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RESPONSE TO DR. JAMES DINNAN'S PRESENTATION

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For those that have attempted, and in most cases have failed, to teach formal grammar to students with reading problems, Dinnan's presentation offers an alternative solution that is very worthwhile.

The formula

$$\frac{C = M - M + R}{E(v)}$$

seems to have more to offer the student as an aid to comprehension than it does as a means to learning the intricacies of formal grammar. Communication/comprehension is related to the written or oral understanding of matter (M) and the relation words (R) of one matter to another matter. One important factor that must be understood with relation words is that they are related to time, space, amount, and quality. Those who have not had the opportunity to be exposed to Dinnan's oral explanation of the interaction of matter and relation words missed an exciting educational experience.

The list of 110 high frequency words and the contrast word for each, researched using other languages, that account for 50% of the language redundancy should be of interest and value to all in the area of reading.

COMPREHENSION THROUGH ORAL LANGUAGE PERCEPTIONS: PARADIGMATIC LANGUAGE TRAINING FOR HEAD START CHILDREN

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The development of measures to determine readiness for reading, basic intelligence, and academic achievement have all relied heavily on the utilization of both word frequency counts and word association. Since the work of Thorndike, word frequency tables have been the basis of controlled vocabulary basal reading series. These lists (such as the *Dolch* and *Rimland*) are consulted in terms of developing oral language training for reading readiness; and consequently, are also found on tests of reading and reading readiness. Association tests; such as: completion, matching, analogy, synonym, and antonym mirror both intelligence and reading readiness in that they simulate some of the cognitive processes also attitudes toward content area reading. The Feasibility and Perceived Skill scores of the *Situations Survey* are particularly interesting indices of confidence that is gained through inservice training.

The role of the reading supervisor was particularly critical as she provided the main linkage between the "theory" workshops delivered by a university professor and the "application" workshops in which the teachers actually created materials incorporating content area reading strategies. Her classroom visits also enabled her to help teachers apply theory in their instruction.

The reading specialists became indispensable team members. Initially content area teachers were reluctant to ask them for help. However, through the workshops the reading specialists grew in their role as resource teachers. In spite of the Title I reading program in Hollidaysburg being primarily a "pull-out" program to provide special reading services to disabled readers, the reading specialists have now become resource personnel in assisting content teachers. Ultimately, we hope that all content teachers who have been trained will become resources to other teachers.

Teacher change is a long-term process requiring coordinated effort on the part of administrators, supervisors, specialists, and classroom teachers. The question that remains, however, is whether teacher change through inservice education has an impact on student achievement. That question is addressed in the next paper.

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STUDY SKILLS: IMPACT OF A TEACHER INSERVICE PROGRAM ON STUDENT ACHIEVEMENT

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Content area reading has received renewed attention as one of the major topics in the field of reading within the last two decades. This focus on reading/study skills is the result of the recognition that the acquisition of reading skills—learning to read in developmental reading classes—does not insure the transfer of these skills to content materials (Fisher, 1974).

Many teachers are aware that poor achievement in content subjects can be related to the difficulty students experience in reading content materials. Karlin (1972) suggested that one contributor to failures is the inability of students to cope with the increasing reading demands made of them. Concerning the high school dropout problem, Rubin (1974) identified the lack of reading skills necessary for success in content classes as one of the most important factors underlying the problem. Singer (1972) also noted that the frustration experienced by intelligent students who are embarrassed because of achievement deficiencies, especially in reading, may cause them to leave school.

School personnel often analyze the scores from the customarily given standardized tests to ascertain the needs of the students. Schleich (1971) found that the scores on a standardized reading test administered as part of a school-wide program showed a significant downward trend from grades nine to twelve for the same group of students. This assessment was conducted prior to the implementation of a content area reading course for the teachers. It seemed to indicate that the higher level reading skills were not being developed.

Diem (1980) noted the dramatic decline of reading and content scores for one school district's students in grades four through twelve. This finding prompted an investigation into curricular problems, and it became apparent that the academic achievement in the content areas was being affected by low reading performance.

A number of programs have been developed to educate content teachers in devising and implementing reading strategies as a part of the courses they teach. Some of these programs are becoming part of the required curriculum for preservice teachers in an attempt to improve the preparation of these future teachers for the needs of students. Others are designed specifically for inservice teachers whose content training included little, if any, course work in the teaching of reading.

Teacher training is a necessary step for improving instruction. However, the effectiveness of a content area reading program is ultimately determined by the students' abilities to use those reading skills for the improvement of achievement in the content areas.

Lee (1977) examined the effects of a competency-based content area reading inservice program on the attitudes and knowledge of reading skills of participating teachers. The exclusion of an assessment of student achievement was cited as a limitation of the study. The reason given for excluding this area as part of the evaluation for the inservice program was that it seemed unrealistic to expect significant gains in academic achievement as the result of teacher participation in an inservice program, especially when the focus of that program is centered on measuring teacher variables related to reading instruction. The measurement of student achievement was recommended for future research because its importance as a variable in teacher education can not be overlooked.

A program designed to improve the attitudes and skills of teachers for integrating reading skils in the content areas should eventually have a positive effect on student achievement. However, the teachers involved in content area reading programs are implementing novel strategies, sometimes under observation, in situations of learning for the teachers. Although these programs are designed to give the participants time to internalize and practice the new ideas, the teachers are not able to effect an overall sequential plan of reading instruction which could be applied to their classes. The evaluation of an inservice program in terms of student achievement might be addressed more effectively in a planned follow-up study to a teacher inservice program.

This investigation was conducted to examine the effects of a competency-based content area reading project for inservice teachers on the reading/study skills achievement of students. The teachers who participated in the project completed the requirements for the inservice course during the 1979-80 school year, a full year prior to this investigation.

This study also examined the influence of the type of assessment instrument used to measure reading/study skills achievement for the evaluation of the teacher inservice project. The subjects of the study were given criterion-referenced and norm-referenced tests.

The following hypotheses were proposed for this study:

1. There will be no significant differences in the reading/study skills achievement scores of students taught by the content area project teachers and students taught by teachers who did not participate in the project, as measured by the criterion-referenced test.

2. There will be no significant differences in the reading/study skills achievement scores of students taught by the content area project teachers and students taught by teachers who did not participate in the project, as measured by the

norm-referenced test.

3. There will be no significant differences in the number of students who attain mastery level (75%) or better on the criterion-referenced test for the groups of students taught by the content area reading project teachers and those taught by teachers who did not participate in the project.

For the purpose of this investigation, reading/study skills are defined as map skills, graph and table skills, and reference skills (Kamm, 1971).

METHOD

Subjects

The subjects of this study were selected from students in grades four, five, eight, and nine of the Hollidaysburg Area School District which is located in west central Pennsylvania.

The experimental group subjects were students in the classes of teachers who participated in the first year of the content area reading project. Twenty-five teachers were initially involved in the project. One year later, however, some of the teachers had been granted leaves, made radical changes in grades taught, or moved from the district. Four of the remaining project teachers were reading specialists and not responsible for content area courses. Thus, six of the original project teachers, three elementary and three junior high, were identified and their students became the subjects of the experimental groups.

The comparison group subjects were the students of teachers who matched, as closely as possible, the project teachers on the following criteria: subject taught, grade placement, high or low achievement class, and years of teaching experience. These teachers had not participated in a content area reading course.

Procedures

Some researchers have suggested that standardized measures of general reading ability are not sensitive enough to distinguish isolated skill improvements that could be attributed to a relatively short treatment period (Jensen, 1976; Peters, Peters, and Kaufman, 1975; Singer, 1976). For this reason, only the reading/study skills achievement of the subjects will be assessed.

No attempt was made to alter the regular class assignments of students to teachers that the district normally followed. All students in the same grade are ranked by reading achievement score. The ranks are then divided into two groups from which they are then randomly assigned to teachers for the classes they need. Because of this procedure intact classes were used and the groups were compared separately for the teachers who were matched. The six classifications for the matched teacher groups were:

Elementary: fourth grade social studies, fifth grade science, fifth grade social studies

Junior high: eighth grade English, eighth grade history, ninth grade math

Instruments. The Comprehensive Tests of Basic Skills (CTBS) were administered to the subjects of this study as part of the regular testing program of the school district in the spring of 1980. The reading subtest of the *CTBS* was used as a measure of general reading ability.

In the spring of 1981 the subjects were given the *Work-Study Skills* subtests of the *Iowa Tests of Basic Skills (ITBS)* a norm-referenced test and selected subtests of the *Wisconsin Tests of Reading Skills Development: Study Skills (WTRSD)*, a criterion-referenced test, as measures of reading/study skills achievement.

Analysis of Data

A t-test was performed on the mean *CTBS* grade equivalent scores of the matched teacher group of students. The data indicated no significant differences in the general reading scores for all classifications except the eighth grade English sections. The experimental group showed a higher significant mean, $t(39)=2.69$, $p < .05$.

The data were analyzed separately for each of the subtests and the total test of the *ITBS* and the *WTRSD* per matched teacher goups with an anaysis of covariance. The raw scores on these tests were adjusted to control for general reading ability, using the *CTBS* as the covariate, in order to determine if significant diferences existed in the reading/study skills scores of the groups of students.

The fourth grade comparison group scored significantly higher on the reference materials subtests of the *ITBS*, $F(1,51)= 5.18$, $p < .05$. The same group also scored significantly higher on two of the six substests and the total test of the *WTRSD*: maps—intermediate directions, $F(1,51)=6.67$, $p < .01$; indexes, $F(1,51)=8.01$, $p < .01$; total test, $F(1,51)=4.51$, $p < .05$. No significant differences were found for either of the fifth grade classes on any of the subtests or the total test.

The eighth grade English experimental group scored significantly higher on all selections of the *ITBS*: visual materials, $F(1,37)=4.91$, $p < .05$; reference materials, $F(1,37)=15.84$, $p < .001$; total tet, $F(1,37)=12.19$, $p < .001$. On the *WTRSD* the eighth grade English experimental group scored significantly higher on one of the five subtests given and the total test: graphs—multiplicative differences, $F(1,37)=9.36$, $p < .01$; total test, $F(1,37)=13.15$, $p < .001$. The comparison group for ninth grade math scored significantly higher on the schedules—problem solving subtest of the *WTRSD*, $F(1,40)=5.69$, $p < .05$.

The Chi square test was used to analyze the data according to mastery versus non-mastery on each of the subtests and the total test of the *WTRSD* for each of the teacher matched groups of students. Significant differences were obtained for the fifth grade science groups for the subtest on dictionary meanings, $X^2=10.76$,$df=1$, $p < .001$ and the total test, $X^2=4.51$, $df=1$, $p \times .05$. The fifth grade social studies groups differed significantly on the point, line, and area symbols subtest, $X^2=5.38$, $df=1$, $p < .05$. No significant differences were found between the fourth grade groups on any of the subtests or the total test.

At the junior high level significant differences were shown for the eighth grade English groups on all but one of the subtests: maps—synthesis, $X^2=7.65$, $df=1$, $p < .01$; graphs—multiplicative differences, $X^2=9.16$, $df=1$, $p < .01$; graphs—projecting and relating, $X^2=4.54$, $df=1$, $p < .05$; schedules—problem solving, $X^2=6.67$, $df=1$, $p < .01$; and the total test, $X^2=9.01$, $df=1$, $p < .01$. No significant differences were found between the eighth grade history or the ninth grade math groups. Generally, there were more students in the non-mastery category for the latter two groups. On three of the subtests none of these students attained mastery.

Discussion

The findings of this study do not favor either the norm-referenced nor the criterion-referenced test for evaluating a teacher inservice program in terms of student achievement. The same groups showed significant differences for the same general skills (maps, graphs and tables, and references) regardless of the type of test. However, the criterion-referenced test had more subtests to indicate specific areas where significant differences were obtained. Also, assessing mastery can provide more direct information as to how well students (as a group) are achieving. This is especially necessary when the results of mean differences are not significant because there is no distinction as to whether the students (again, as a group) are achieving the goals set before them or not, just that the groups do not differ.

Since only one group at each level showed significant differences on more than one subtest of either type of test, no definite pattern of significant differences was established from class to class in the elementary or junior high setting. One possible reason for this could be that reading/study skills are not emphasized as much as other areas of reading instruction. The content area reading courses for teachers usually introduce strategies for developing vocabulary and comprehension before reading/study skills possibly causing teachers to infer, incorrectly, a hierarchy inherent in these categories. Morrison (1980) found that some content area teachers did not consider the reading/study skills as important as other reading skills for their content areas. This could account for the low number of students who attained mastery in the eighth grade history and ninth grade math classes. Future research should be directed at a comparison of achievement levels of students in regard to the various aspects of reading skills as they apply to particular content areas with the amount of instructional time provided for each aspect.

One aim of the original Content Area Reading Program was to have teachers become resource persons for other teachers in the district as part of an ongoing inservice program. It seems that the 'sharing' attitude of teachers, especially on the elementary level, may account for the lack of significant differences between the groups in those classe. Some students in all of the elementary classes attained mastery on all of the reading/study skills assessed as opposed to the groups in two classes of the junior high students in which no one attained mastery on certain skills. Teachers who are encouraged to participate in providing inservice for other teachers can facilitate changes in instructional procedures which will benefit the learners.

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SECONDARY STUDENTS' FREE RECALL AS A MEASURE OF COMPREHENSION AND EQUIVALENCY OF CONTENT AREA PARAGRAPHS

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Traditionally, the informal reading inventory (IRI) has been employed as a criterion-referenced measure of students' reading comprehension ability (Farr and Roser, 1979). The most important component of silent reading achievement evaluated is the level of difficulty of text a reader can comprehend, which can be determined more accurately via a well-constructed, well-administered IRI than by a standardized achievement test (Harris and Sipay, 1980). A student's silent reading comprehension achievement is frequently based on his ability to recall exact wording from a passage in order to answer specific literal questions. One of the most commonly-employed IRI's in university reading clinics, *The Durrell Analysis of Reading Difficulties* (Durrell, 1955) goes so far as to ask the reader to verbalize all he/she can recall from the passage. These memories are then used as a measure of silent reading comprehension.

Many reading specialists and clinicians use the IRI to evaluate students' academic achievement during a specific remediation program, utilizing paragraphs deemed "equivalent" by IRI authors to pre and posttest.

This study examines 1) the recall of exact wording from grade level equivalent IRI paragraphs by secondary students; 2) weighting of exact wording recalled by students from three content area paragraphs; and 3) the relationship between subjects (Ss) sex, grade level, serial learning ability, and exact and weighted recall of three paragraphs.

METHODOLOGY

Subjects

Forty secondary students participated in this study: 20 males and 20 females selected from grade levels nine and eleven at Acadiana High School (student population, 2,300). Homeroom teaches of students enrolled in the honors curriculum were asked to rank their students by grade point average; the top half of each group were pooled across classrooms. Random selection of 10 ninth grade males, 10 ninth grade females, 10 eleventh grade males, and 10 eleventh grade females was conducted using a table of random numbers. Scores from the *SRA Achievement Test* were available for the ninth grade students, who scored on the following subtests, according to the national percentile 72.11—Vocabulary Subtest, 77.58—Comprehension Subtest, and 76.05—Composite Reading Score.

Procedure

Ss were tested in small groups of 10 students; each of the three experimental sessions lasted approximately 45 minutes, with sessions scheduled one week apart. During the first session, students completed a knowledge inventory designed to determine self-assessed knowledge of specific topics listed by the examiner. A five-point Leikert-like scale (1=I know nothing about this subject, 5=I know everything there is to know about this subject) was used to gauge the student's attitude toward how much he/she knew about eight topics, three of which were topics of the three paragraphs which the student would read later, five of which were placebo topics. The 40 students averaged 2.85 on the five-point scale for the topic "zoo animals," 1.93 for the topic "lunar exploration," and 2.40 for the topic "trees." Their responses ranged from "I know very little about this subject" to "I know something about this subject."

Ss then read one of three expository passages of 163 words (Forms A, C, and D) selected at random from the *Ekwall Reading Inventory* (Ekwall, 1979). Readability level of the passages was determined to be eighth grade level, based on the

Harris-Jacobson Readability Formula (Harris and Sipay, 1980). Passages were composed by Ekwall, and normed on 40 students. Reliability of passages, based on administering forms within a period of one week, resulted in product moment correlation coefficients of .79 between Forms B and D, and .82 between Forms A and C. The topic of the paragraph labeled Form A is lunar exploration; this paragraph will be henceforth referred to as the *moon paragraph*. The topic of the paragraph labeled Form C is the ostrich, henceforth referred to as the *ostrich paragraph*. The topic of the paragraph labeled Form D is the rubber tree, henceforth referred to as the *rubber paragraph*.

Students were presented with one of the three paragraphs, and told to read the paragraph carefully; they were cautioned to remember as much of the paragraph as possible, since they would be asked to recite all they could remember from the paragraph into a cassette tape recorder later. Students were allowed as much time as they desired to read and to study the paragraph. They were then administered a serial learning task comprised of 12 neutral words presented in four trials with words exposed for two-second intervals; the task is one developed by Bloomer (1978) as part of a learning process test battery, and has been carefully normed and validated. Students attempted to memorize the words, and then wrote down the words they remembered for each of the four trials during a 20-minute interval.

Ss then recited all they remembered from the passage into a cassette recorder. Prompts were then provided in order to cue further recall. This procedure was repeated twice at one week intervals, until all paragraphs had been read.

Scoring

Protocols were scored twice, once for retention of exact wording, and then for retention of weighted wording. Specifically, a computer program was developed by USL computer programer Wayne Vicknair to match exact wording from an original or source paragraph with wording from a protocol (transcribed tape recording of a Ss' recitation of what he/she had remembered from a passage). For each word in the protocol which matches the original, a score of one is indicated, while a score of zero is indicated if the computer is unable to make that match. The program prints a list of one's and zero's for each word in the source paragraph, and totals the correct matches. A cumulative frequency distribution of matches for each word in the source paragraph is also printed.

Researchers in the area of discourse analysis suggest that recall should be weighted, that a Ss' recall of a determiner (*a, an,* or *the*) should not be weighted as heavily, because of the frequency of occurance due to the syntax of the English language, as verbs, subject nouns, direct objects, etc. which carry the brunt of the author's message. The Dolch 220, a list of basic sight words, comprises approximately 51% of text printed in English; due to their high frequency of appearance, they should probably not be weighted as heavily, since what characterizes the difference in meaning from one text to another is the content, which generally contains words of a more technical nature not contained in the Dolch list. The investigator, interested in weighting the protocols, simplistically decided to weight subject nouns and verbs as 6; auxillary verbs, 5; direct objects, indirect objects, predicate nominatives, and predicate adjectives, 4; infinitives, conjunctions, prepositions, objects of prepositions, 3; adjectives and adverbs, 2; determiners, 1. While recognizeably an over-simplistic method of handing weighting of exact wording, eventually hopes to develop a system for grading protocols which could be used by classroom teachers, who do not have the time necessary for the elaborate methods employed by researchers in discourse analysis for grading protocols. Vicknair's computer program provides a method of weighting individual words; the entire scoring cycle is then repeated, resulting in a score reflecting the examiner's weighting of words in the original paragraph matched with Ss' protocols.

Analyses

A packaged statistical program (*SPSS*, Nie, Hull, Jenkins, Steinbrenner, and Bent, 1970) was used to compute frequency distributions, descriptive statistics, Pearson product moment correlation coefficients, *t*-tests, and analyses of variance.

RESULTS

On the average, Ss retained 88.45 (54.25%) of the 163 words from the rubber paragraph, 71.96 (44.14%) of the words from the ostrich paragraph, and 73.27 words (44.95%) from the moon paragraph. The mean number of correct responses to the five comprehension questions was 4.14 (rubber paragraph), 4.42 (ostrich paragraph), and 4.13 (moon paragraph). Total scores on the three repetitions of the serial learning task (possible raw score=48) were 36.25, trial one; 36.50, trial two; and 36.75, trial three. Ss recalled, on the average, 6.34 of the 12 words presented in the first serial learning task one week after the initial presentation of the words, and 9.21 of the 12 words one week following the second presentation of the words. When the exact recall of wording from paragraphs was weighted as described earlier, Ss' mean scores were 294.29, rubber paragraph; 235.36, moon paragraph; and 253.43, ostrich paragraph.

Computed Pearson product moment correlation coefficients revealed low to moderate positive correlations between Ss' scores from the three serial learning tasks and the reading achievement scores from the SRA *Achievement Test, Level F* (see Table 1). Correlations computed between Ss' SRA scores and recall of paragraphs and weighted recall of paragraphs revealed mild, statistically non-significant positive correlations (see Table 2).

Correlations between Ss' self-assessed knowledge of topics associated with the main ideas of the paragraphs and their exact recall of wording were .42, .23, .02 with moon, rubber, and ostrich paragraphs, respectively. Little correlation was noted between self-assessed knowledge of the three topics by the 40 students (.27, ostrich; .07 rubber and .28, moon).

Ss' exact recall of wording from the three paragraphs was compared via *t*-tests, which revealed statistically significant differences between recall from the rubber paragraph (mean word recalled=86.72) and the moon paragraph (mean words recalled =74.21). No statistically significant differences on computed *t*-tests were noted between recall scores from the paragraphs on the moon and the ostrich, or between recall from the paragraphs on the ostrich and rubber. These results were replicated with weighted recall of the three passages. Correlation coefficients ranging between 0.54 and 0.65 were noted between the exact recall of wording from the three paragraphs and between 0.51 and 0.67 between weighted recall from the three passages (see Table 3).

Examination of correlation coefficients revealed low to moderate positive correlations between exact recall of the three paragraphs and the serial learning tasks, weighted recall of the three paragraphs and the serial learning task, and students' correct responses to the comprehension questions (prompts) and their scores on the serial learning task (see Table 4).

Table 1.

PEARSON PRODUCT MOMENT CORRELATION COEFFICIENTS BETWEEN SERIAL LEARNING AND SRA READING ACHIEVEMENT TEST SCORES (N=19)

	Serial Learning Task		
SRA Subtests	**Trial 1**	**Trial 2**	**Trial 3**
Vocabulary	0.27	0.03	0.45*
Comprehension	0.16	0.16	0.59**
Composite	0.24	0.09	0.55**

*p < .05
**p < .01

Table 2.

PEARSON PRODUCT MOMENT CORRELATION COEFFICIENTS BETWEEN SRA ACHIEVEMENT TEST SCORES IN READING AND EXACT RECALL OF PARAGRAPHS AND WEIGHTED RECALL OF PARAGRAPHS

	SRA Reading Subtests		
Exact Recall of	**Vocabulary**	**Compre-hension**	**Composite**
Moon Paragraph	0.28 (N=17)	0.38 (N=17)	0.29 (N=17)
Rubber Paragraph	0.11 (N=17)	0.36 (N=17)	0.24 (N=17)
Ostrich Paragraph	0.28 (N=8)	0.04 (N=8)	0.15 (N=8)
Weighted Recall of			
Rubber Paragraph	0.10 (N=17)	.039 (N=17)	0.24 (N=17)
Moon Paragraph	0.25 (N=17)	0.32 (N=17)	0.24 (N=17)
Ostrich Paragraph	0.24 (N=8)	0.02 (N=8)	0.18 (N=8)

Note: All of the above correlation coefficients are statistically significant at the .05 level.

Table 3.

PEARSON PRODUCT MOMENT CORRELATION COEFFICIENTS BETWEEN EXACT RECALL OF WORDING FROM THREE PARAGRAPHS AND WEIGHTED RECALL FROM THREE PARAGRAPHS

Exact Recall of Wording from:	Verbatim Recall of Paragraph Wording		
	Moon Paragraph	Rubber Paragraph	Ostrich Paragraph
Moon Paragraph		0.70** (N=29)	0.65** (N=18)
Rubber Paragraph			0.54** (N=19)
Weighted Recall of Wording from:			
Rubber Paragraph	0.67** (N=29)		
Moon Paragraph			0.61** (N=18)
Ostrich Paragraph		0.52** (N=19)	

* < .05
**P < .01

Table 4.

PEARSON PRODUCT MOMENT CORRELATION COEFFICIENTS BETWEEN Ss' EXACT RECALL, COMPREHENSION, AND WEIGHTED RECALL OF THREE PARAGRAPHS AND SCORES FROM CORRESPONDING SERIAL LEARNING TASKS

Raw Scores from Serial Learning Tasks Correlated with:	Pearson r.	N of Ss	Level of Significance
Recall of moon paragraph	0.29	33	.05
Recall of rubber paragraph	.057	35	.01
Recall of ostrich paragraph	0.05	23	.42
Comprehension of moon paragraph	009	32	.32
Comprehension of rubber paragraph	0.43	35	.01
Comprehension of ostrich paragraph	0.27	24	.10
Weighted recall of moon paragraph	0.28	33	.06
Weighted recall of rubber paragraph	0.55	35	.01
Weighted recall of ostrich paragraph	0.04	23	.43

Two-way analyses of Ss' raw scores from the serial learning task (trials one, two and three) by sex by grade reveal statistically significant differences ($p < .05$) by grade level on trials one and two, with means higher for ninth grade students. No statistically significant differences were noted between sex and serial learning scores, or between grade level and serial learning scores from trial three.

Pearson product moment correlation coefficients between exact recall of paragraphs, weighted recall of paragraphs,a nd students' comprehension scores for the paragraphs are presented in Table 5. The correlation coefficients are positive, but low to moderate between students' exact recall and their comprehension of the questions, and show moderate to high statistically-significant relationships between comprehension scores and weighted recall.

One-way analyses of variance revealed no statistically significant differences between sex of Ss and Ss':

1) comprehension scores from the three paragraphs;
2) exact recall of wording from the three paragraphs;
3) weighted recall of wording from the three paragraphs;

However statistically significant differences exist between ninth and eleventh grade students:

1) comprehension scores from the three paragraphs;
2) exact recall of wording from the three paragraphs;
3) weighted recall of wording from the three paragraphs.

Grade level differences favored ninth grade students; their mean scores were higher in all of the above three analyses.

Table 5.

PEARSON PRODUCT MOMENT CORRELATION COEFFICIENTS BETWEEN Ss' RESPONSES TO RELATED COMPREHENSION QUESTIONS AND THEIR EXACT RECALL AND WEIGHTED RECALL OF THREE PARAGRAPHS

Related Comprehension Scores Correlated with:	Pearson r	N of Ss	Level of Significance
Exact Recall of:			
Moon Paragraph	0.62	32	.01
Rubber Paragraph	0.32	35	.03
Ostrich Paragraph	0.28	23	.10
Weighted Recall of:			
Moon Paragraph	0.99	33	.01
Rubber Paragraph	0.99	35	.01
Ostrich Paragraph	0.98	23	.01

CONCLUSIONS

Secondary students retained between 44 and 54% of the exact wording from three eighth grade level paragraphs, a much higher percentage of retention than that reported by McKoon and Keenan (reported in Kintsch, 1974; McKoon, 1977), whose Ss recalled only 25% of the exact wording of passages read. Lovelace (1980), employing the same passages used in this study, noted that adults aged 20-39 retained a mean of 37.4 (25%) of the exact wording of the paragraphs. Statistically significant differences in recall of exact wording were based on the higher mean scores of ninth grade students who also scored significantly better than the eleventh grade students on two of the three serial learning task trials. Further investigations might help determine if older students and adults develop the ability to increase memory for the gist of a paragraph with a resulting decline in verbatim recall, or whether they develop a cautiousness factor, similar to that noted in adult cognitive studies, which makes them more reluctant to vocalize information if they are not absolutely certain that the information is appropriate.

While Ekwall reported a reliability coefficient of .79 between the rubber and moon paragraphs, statistically significant differences were noted in Ss' ability to recite exact wording from the passages (mean recall of wording from rubber paragraph=88.43, mean recall of wording from moon paragraph=73.27). Significant differences were also noted in Ss' comprehension of the prompts provided after the free recall. Again, ninth grade Ss' mean scores appear to be the source of the difference.

This study suggests that the three paragraphs, equivalent in readabilty level according to the Harris-Jacobson formula, are not equivalent for ninth grade Ss, as far as verbatim recall of wording, weighted recall of wording, and comprehension scores are concerned. Pre- and post-testing using these equivalent pargraphs are is recommended as a means of determining these students' gains in reading achievement over a period of time.

Serial learning apparently is not a primary factor in reading achievement as measured by standardized reading tests, which may be due to the differing demands made on the reader by the two tasks. Standardized reading achievement tests generally allow the reader to search the passage for the correct answer to a multiple choice team, whereas recall of wording demands that the reader search long-term memory and discriminate among pieces of information in order to retrieve the correct information. Evidence from this study adds credence to the existence of differing demands placed on the reader by the two types of tasks.

Correlation coefficients between what students thought they knew about the paragraph topics and their actual recall are low, perhaps indicating an element of cautiousness on the part of the Ss, who may not have been willing to self-assess their knowledge, or who may have been unsure of just what particular concepts they were being asked to evaluate. A semantic differential technique will be employed in the replication of this study.

Weighted verbatim recall of passages correlated between .98 and .99 with Ss' comprehension of passages as measured by answers to comprehension questions (prompts), whereas exact recall correlated with comprehension resulted in coefficients of .28 to .62. Weighting of exact recall of wording appears to be a more accurate means of measuring students' understanding of prose.

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SECONDARY STUDENTS' KNOWLEDGE OF TEXTBOOK METASTRUCTURE

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The concept of textbook metastructure has no direct research precedent in educational literature. There exist, however, several lines of inquiry which led to the present study. Research on metalinguistics has investigated learners' knowledge of the technical, linguistic vocabulary used to talk about language (Downing, 1972; Mattingly, 1972). Adopting this line of thought, metastructure has been defined as the technical, linguistic vocabulary used to talk about textbooks (Mateja & Wood, 1981).

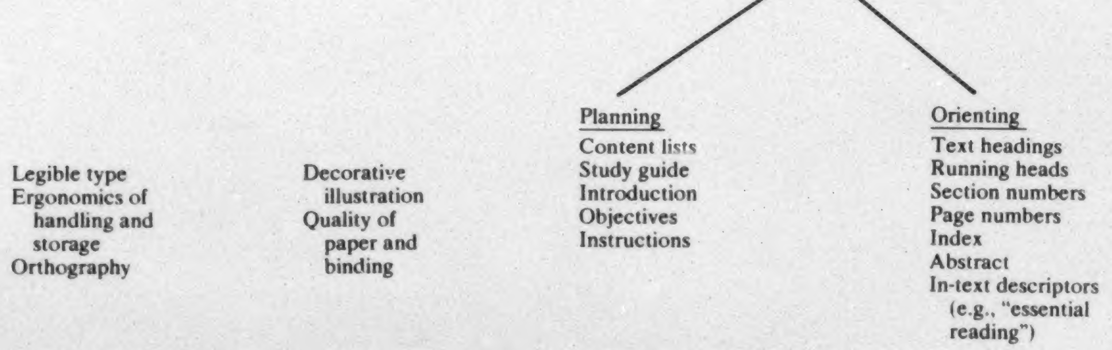
Vernon's findings (1957) that reading problems were strongly associated with cognitive confusion and a lack of system were expanded by Downing (1979) into the Cognitive Clarity-Cognitive Confusion Theory. The major premise of the Cognitive Clarity-Cognitive Confusion Theory is that learners experience various degrees of cognitive understanding and cognitive bewilderment as they pass through stages of knowledge. In essence, learners are seen as simultaneously manifesting clarity and confusion—clarity with respect to those skills and knowledge which have been mastered, and confusion with respect to those skills and knowledge which need to be learned. In order to understand the nature of reading, therefore learners need to acquire two necessary abilities regarding its: 1) purposes and 2) technical characteristics (Vernon, 1971).

Applied to textbooks, the logical place to investigate learners' abilities would be in their presentation functions. For example, Waller (1977a) identified three types of presentation functions: 1) enabling, 2) stylistic and 3) access. Access structures were further divided into two types—those which helped readers plan their strategies and those which helped readers execute their strategies. (See Figure 1) Waller's structural arrangement contains many of the complex, conceptual units relating to content area textbooks. Macdonald-Ross (1978) reasoned that access structures provided parallel guidance from typography (microtypography, macrotypography) as provided by text meaning units (micropropositions, macropropositions) (Kintsch & van Dijk, 1978; Kintsch & Vipond, 1979). Whalley (1980) posited that readers could avail themselves selectively of both the linguistic and extralinguistic cueing systems in order to learn efficiently from discourse. Such signals may provide information to readers for relevance assignment (van Dijk, 1979), especially if they are made explicit in the text processor system via numbering, emboldening or footnoting (Whalley, 1980).

Research on the effects of textbook layout and organization has confirmed much of the intuitive thinking on typographic

Figure 1

Text Presentation Functions


ENABLING FUNCTION
STYLISTIC FUNCTION
ACCESS FUNCTION
Planning
Orienting
Legible type
Ergonomics of handling and storage
Orthography
Decorative illustration
Quality of paper and binding
Content lists
Study guide
Introduction
Objectives
Instructions
Text headings
Running heads
Section numbers
Page numbers
Index
Abstract
In-text descriptors (e.g., "essential reading")

cueing systems. Results suggest that various visual organizational patterns influence learners' comprehension (Hartley & Burnhill, 1977; Wendt, 1979; Holley *et al.*, 1981). Additionally, more complete graphic aids under conditions of forced study improve learners' recall (Dean & Kulhavy, 1981; Schwartz & Kulhavy, 1981). These studies point toward learners' developing feature-location skills for remembering graphic-discourse arrangements because neither reading achievement nor academic success guarantees facility with study skills (Hawkins, 1977; Johnson & Crano, 1978).

The idea of replacing all the letters and numbers on the printed pages with *x*s or *X*s has been suggested by some learning experiments. *X*s have been employed in studies of pattern recognition for concept formation (Garner, 1974; Royer & Garner, 1966, 1970) and of spacing conditions for meaning stimulus span during eye fixations (McConkie & Rayner, 1975). They have also been used in demonstrations of teaching the concept of textbook organization (Binkley & Gerhard, 1980) and of notation systems for graphic variables (Twyman, 1981). Mateja and Wood (1981) have termed such a modification to textbook layouts "content-deleted text" because it maintained the concept of overall surface structure (i.e., visual, spatial and syntactic) while it eliminated the discourse's deep structure (i.e., propositional and semantic). Research with normal text consistently has found that younger and poorer readers have attended to the surface structure to the detriment ofmeanings (Canney & Winograd, 1979; Garner, 1980), although little difference has been found between groups on their use of syntactic and semantic cues to make corrections until the materials increased in difficulty (D'Angelo, 1981).

Purpose

The purpose of this study was to assess secondary students' knowledge of the technical, linguistic vocabulary used to refer to the access structures of textbooks as well as the relationships between and among particular access structures, graphics and text. Students were assessed with a content-deleted text so that interactions with information in the text would be minimized, but also, so that differences in reading achievement and text readability would be somewhat controlled.

METHOD

Subjects

A total of 156 students, 67 seventh- and 89 twelfth-graders were selected as subjects. Subjects were tested in hetergeneous, intact content area classrooms during normal class periods. The classroom teachers (1 @ 7th, 1 @ 12th) provided a reading ability rating for each student. The study was conducted near the end of the academic year to enable teachers to identify students' reading levels with greater confidence and accuracy, and also to ensure that twelfth-graders would have reached their maximum public school potential before graduation and that seventh-graders would have had almost a year's experience in a departmentalized setting.

Materials

The stimulus materials consisted of a two-page, content-deleted excerpt from a middle-school, science textbook (Heimler & Lockard, 1977). The content was deleted by replacing all letters and numbers with *x*s or *X*s of equal point size and weight. This was done to minimize the interaction between readers and the content in the text, but also, the highlight the textbook's access structures. Graphics were masked enough to reduce content, yet allow for locational identification as place holders.

Assessment instrument

A 20-item, multiple-choice assessment instrument was developed to measure subjects' knowledge of access structures and the language used to refer to them in the content-deleted text. Specifically, test items measured subjects': a) recognition of particular access structures and b) understanding the relationships between or among access structures, graphics and text. Conbach's Alpha Indices (test-retest) revealed a reliability coefficient of .78 for the instrument.

Procedure

Subjects were given a 10-minute training session with a normal and a content-deleted personal letter as well as sample questions. Afterwards, subjects were allowed five minutes to study the two-page, content-deleted excerpt. Finally subjects were issued the assessment instrument and were instructed to use the content-deleted text to answer the questions. Subjects were allowed to work at their own rate, and all subjects completed the assessment instrument by the end of the period.

Results

Subjects' protocols were analyzed in terms of gender membership (male, female), age-for-grade in the sample (average and above average, below average), grade level (7th, 12th) and reading ability rating (above average, average, below average).

Table 1

MEANS AND STANDARD DEVIATIONS FOR TWO AGE GROUPS

Age	n	$\overline{X}$	sd
Below average	48	11.48	3.68
Average or Above average	108	10.55	4.35
(BA + A.AA)	N = 156		

Table 2

MEANS AND STANDARD DEVIATIONS FOR TWO GENDERS

Gender	n	$\overline{X}$	sd
Male	85	11.22	4.20
Female	71	10.37	4.12
(M + F)	N = 156		

Table 3

MEANS AND STANDARD DEVIATIONS FOR TWO GRADE LEVELS

Grade Level	n	$\overline{X}$	sd
Seventh (7th)	67	9.42	3.71
Twelfth (12th)	89	11.90	4.19
(7th + 12th)	N = 156		

Table 4

MEANS AND STANDARD DEVIATIONS FOR THREE READING ABILITY LEVELS

Reading Level	n	$\bar{X}$	sd
Above Average (AA)	74	12.70	3.97
Average (A)	44	10.68	3.55
Below Average (BA)	38	7.37	2.77
(AA + A + BA)	N = 156		

Data were analyzed using a 2 × 2 × 2 × 3 factorial (age × gender × grade level × reading level) ANOVA with an unbalanced design. Results for the four variables are reported in Tables I-IV.

There were not statistically significant interactions between or among gender, age, grade level and reading level. No statistically significant differences were found for gender [$F(1,133)=.18$; $p < .67$] or age [$F(1,133)=0.01$; $p < .98$]. Statistically significant main effects were found for both grade level [$F(1,133)=24.98$; $p < .0001$], and reading level [$F(2,133)=28.97$; $p < .0001$] with reading level accounting for a greater proportion of the variance. A series of Scheffe *post hoc* multiple comparison tests revealed that the above average readers scored statistically significantly higher than both the average and below average readers. Average readers, meanwhile, scored statistically significantly higher than below average readers. Finally, twelfth-graders' scores on the criterion measure were statistically significantly higher than seventh-graders' scores. Tests of importance (Cohen, 1965) revealed that reading level and grade level accounted for approximately 42% of the variance in scores on the criterion measure.

Discussion

In terms of extending the Cognitive Clarity-Cognitive Confusion Theory to middle and high school students' knowledge of textbook metastructure, the data support the notion that readers continue to experience differential states of clarity and confusion. Above average readers generally appeared to be in a state of cognitive clarity across grade levels. However, below average readers generally appeared to be in a state of cognitive confusion in spite of grade level. Average readers generally appeared to experience varying degrees of clarity and confusion, with twelfth-graders enjoying greater clarity and seventh-graders encountering greater confusion. On the whole, twelfth-graders were characterized by greater clarity and seventh-graders by greater confusion. Both boys and girls and students at different ages within grades generally appeared to experience similar states of clarity of confusion.

Whereas the data lend general support to the Cognitive Clarity-Cognitive Confusion Theory, the phenomena seem to be a more function of achievement than development, at least for knowledge of textbooks' access structures. The results support the importance of facility with print over the chronological development for the ability to use textbook metastructure. From this perspective, it appears that above average readers have gained understanding of the technical concepts needed for talking and thinking about the tasks involved in acquiring the skillful use of textbook metastructure (Vernon, 1971; Fitts & Posner, 1967). These results would appear to support the value of world knowledge and prior experiences (Vernon, 1970) for perceptual-cognitive flexibility and behavior (Thurstone, 1944).

The results also support other research on metacognition, metalinguistics and metacomprehension (Brown, 1978, 1980; D'Angelo, 1981) which finds that better and older readers not only prove more facile when engaging in problemsolving with print, but also that they possess greater awareness of their understanding or misunderstanding as they work through problems. It would appear that above average and older readers are able to spontaneously generate coping strategies which are both complex and varied enough to solve tasks which require simultaneous processing of visual, configural and relational stimulii. In this respect, above average and older readers can be associated with greater flexibility in their search, location and utilization of alternative solutions when presented with print-related problemsolving tasks. Above average readers, in particular, seem to have mastered the two phases of knowledge as identified by Vygotsky (1962) in that they possess both an automatic unconscious acquisition of knowledge and an active conscious control over their learning.

Implications

If knowledge and experience represent the distinguishing factors between clarity and confusion in regard to the technical, linguistic vocabulary used in conjunction with textbooks, then the most obvious educational implication is training, with an especially heavy emphasis on vocabulary (Davis, 1941). Research on instruction in visual spatialization tasks supports the notion of students' amenability to learning (Goodson, 1981; Johnson & Crano, 1978; Kerst & Howard, 1978). Similar results are reported for training students to utilize text structure and organizational patterns (Meyer, 1975; Meyer, Brandt & Bluth, 1980; Meyer & Freedle, 1979).

Using Waller's taxonomy of access structures (1977a,b) for micro- and macro-typography, teachers can help students to become aware of and utilize such cueing systems. Direct teacher intervention might take the form of a six-step, full-processing model in which the teacher 1) models his/her behaviors on a sample textbook, 2) provides an initial teacher-and-students practice session with more modeling, 3) provides a second teacher-and-students practice session for students to share their strategies with each other, 4) provides a third practice session for students to use their own and others' strategies, 5) provides students with a practice session in which they work alone and then check their work and 6) plans for systematic followup on a regular basis. On all occasions the teacher needs to supply knowledge of results to students as well as employ a variety of materials for a variety of purposes.

Whatever learning strategy is employed in teaching textbook metastructure, it appears that students' self-awareness, self-knowledge and self-monitoring can be raised by emphasizing problemsolving, troubleshooting and bookhandling skills. To be effective, every strategy might benefit from including: 1) each student's basic learning techniques, 2) the rules regulating textbook layout, 3) the many, different uses and purposes of textbooks, 4) direct experiences with a variety of textbooks under kaleidoscopic conditions and 5) the importance of bringing to bear world knowledge and prior experience in learning from textbooks.

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REACTION: SECONDARY STUDENTS' KNOWLEDGE OF TEXTBOOK METASTRUCTURE

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Mateja and Wood have used a logical procedure to determine secondary students' knowledge of the metastructure of a content text. Interestingly, skill in using this metastructure to better understand content information is an ability which content teachers assume that students possess. However, as found in this study, this ability varies from grade to grade and is affected by the student's reading level.

Reading specialists acknowledge the importance of textbook format and typographical aids in enhancing the comprehension of content materials. Although the skill has been accepted as an important one for some time, little instruction has occurred in the elementary or secondary schools to further develop the skill. The procedure used by Mateja and Wood to assess students' use of textbook metastructure is an excellent way for content teachers to assist in the teaching of this necessary skill for content reading. Using their system of xs with pages from the content text, teachers may demonstrate how textbook metastructure provides clues which aid comprehension. Following this demonstration, the students may work in groups using the actual text material and the metastructure to survey the content of the material and develop questions which may be used as guides for reading. Awareness of textbook metastructure will assist students as they survey materials prior to reading.

If students were aware of the textbook metastructure, their ability to identify organizational patterns of text materials would be enhanced. Because content textbooks follow definite organizational patterns (Cheek and Cheek, in preparation) and because students' ability to recognize organizational patterns seems to be beneficial in improving comprehension of text materials (Meyer, Brandt, and Bluth, 1980), this study has specific implications for reading instruction at the secondary level. These include:

(1) Understanding of textbook metastructure may be a skill which secondary teachers can assist their average and below average readers in developing in order to help them better comprehend their content materials.

(2) Developing an understanding of textbook metastructure should help students in recognizing the pattern of organization in the text. This in turn should assist in determining which comprehension skills are to be applied to best understand the material.

(3) Helping content teachers become aware of the textbook metastructure will provide them with a basis for understanding how to help students learn to read content materials.

While research as to the importance of textbook metastructure is only beginning and the relationship of this metastructure to organizational patterns is based more on logic than on research, it appears that these areas are extremely important to improving the reading of secondary content materials. Of course, secondary students who have developed the ability to apply many of the comprehension skills to their content materials use textbook metastructure and the organizational patterns of the text narrative to further their understanding. But the average and below-average readers need more "crutches" to help them comprehend content text material. Perhaps these are the missing links which content teachers need to teach in order for content learning to be an achieveable goal for a larger percentage of our secondary students. Textbook metastructure seems to be the logical first step to improving comprehension of content materials!!

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CRITICAL READING, REASONING, AND CONSUMER DECISION MAKING

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Recent national and international events have brought to public attention the finiteness of resources in the economic, political, and social environments. Almost daily the media brings news about double-digit inflation, fluctuating interest rates, higher gasoline prices, unemployment, budget cuts, etc. In this technological environment the consumer-citizen is required to make complex economic decisions affecting not only the individual but the family and larger national and international communities as well. Both individual and social costs and benefits need to be evaluated before each consumer financial decision is made. Thus, consumer decision making is an inherent part of daily living.

Consumers are influenced by the market environment which transmits information in the forms of print and non-print media. Such information may often present conflicting perspectives regarding the benefits and costs of a purchase, investment, etc., to the consumer. Where print is the primary source of consumer information, the abilities to read, analyze, and judge the validity of information presented are necessarily important. Subsequent consumer decisions made on the basis of this information need to be well thought out.

Impulsive consumer decisions may have negative financial consequences for individual consumers. Further, since consumer decisions do have an impact on the socio-economic environment, the ability of citizens to use reading and decision making skills has implications for society. Teachers at all grade levels need to recognize the importance of instruction in reading and decision making skills for consumer education. That is, consumer education should not be left to chance.

Previous research, however, has indicated that adults and children lack some of the skills needed to make consumer decisions and are not capable of solving fundamental consumer problems encountered in daily life. None of the studies reviewed investigated the potential problems children and adults might have in formulating decisions. Specifically, little or no attention has been given to the processes used in reaching a final consumer decision. Instead, most of the studies have focused on subjects' knowledge of consumer economics and application of that knowledge.

Harris and Associates (1970) attempted to assess people's ability to complete government and business forms. A sample of 1,685 individuals 16 years and older representing the civilian non-institutionalized population of the continental United States participated in the study. The findings of the study revealed that three percent of the sample or an estimated 4.3 million persons fell into the lowest literacy category. Two percent of the sample or an estimated 7.1 million individuals fell into the category termed "questionable survival."

A second study by Harris (1971) also used government and business application forms as test material to measure literacy levels. Portions ofthe test were taken from authentic forms often used by many Americans. Additional questions based on classified advertisements and telephone dialing instructions were included in the 57 item survey test. Procedures for sample selection were the same as in the earlier Harris (1970) study. Results of the survey revealed that an estimated 15 million adults would have great difficulty completing the required forms in real life situations.

The forms used by Harris in both studies reflect demands placed on consumers in daily life. And reading skills used in completing a variety of forms are a prerequisite for successful independent consumer activities. Although both of Harris' studies were commendable efforts in identifying illiteracy levels, it was beyond the scope of his studies to focus on consumer skills above the knowledge level.

The Adult Performance Level Project (APL), established in 1971, was concerned with assessing knowledge and skills competencies of the continental U.S. adult population aged 18 to 65 years old (University of Texas—Austin, 1977). Among the skills areas assessed were reading, writing, speaking, and listening (communication). Consumer economics comprised one of the general knowledge areas. Three literacy levels were determined on the basis of income, education, and occupational status. These literacy levels ranked from lowest to highest were labeled APL 1, APL 2, and APL 3. The resulting raw scores from the assessment instrument were defined in terms of the same three APL levels.

Predictions about the performance levels of the adult population with respect to the knowledge and skills areas were then made. Of special significance to the present discussion were the findings related to reading and consumer economics. Specifically, the results of the test measuring knowledge of consumer economics indicated that 29.4 percent of the population fell into the APL 1 category, approximately one-third (33.0 percent) of the population were APL 2's, and 37.6 percent were APL 3's. There were fewer subjects who were classified as APL 3's in consumer economics than in other knowledge areas assessed. These findings suggest that consumer economics is one knowledge area which proved difficult for subjects, perhaps because of limited educational opportunities provided in consumer economics.

A closer examination of some of the test items (University of Texas – Austin, 1977) reveals that success on those items depends upon the ability of the respondent to use reading skills. For example, one item required that respondents observe a notice describing a check cashing policy and draw a correct conclusion related to that policy. The APL levels for reading indicate that 21.7 percent of the population were operating at level one, while 32.2 and 46.1 percent were operating at levels two and three respectively.

The dta from the APL study reveal that reading skills and consumer education are needed and should receive additional attention in the schools. For the most part, the consumer economics objectives used for the APL project are at the knowledge and comprehension levels as defined by Bloom (1956). The final report did not list reading objectives although this skill area was assessed.

The National Assessment for Educational Progress and the Food and Drug Administration (NAEPFDA, 1979) collaborated on a pilot study in 1977 to ascertain whether or not the average American adult can read and understand labels on foods, drugs, and medical devices. More than 1,200 adults aged 26 to 35 years of age participated in the study. Findings from the investigation suggest that the higher the educational level of the respondent, the more likely s/he is to comprehend the information on the label and to deduce information not included on the label which could be of critical concern to health and safety. For example, one item required interpretation of a drug interaction precaution written on the label. This study is important since authentic examples of labels were used to test consumer and reading skills necessary for survival.

A second study conducted by the National Assessment for Educational Progress (NAEP, 1979) assessed the consumer skills of 17 year-olds in the following areas: 1) Economics, 2) Consumer Protection, 3) Energy, 4) Finance, 5) Consumer Behavior (advertising, decision making, and shopping), 6) Contracts, 7) Purchasing, and 8) Mathematics. An examination of test items used in the teenage consumers study shows that many of the items require prior knowledge of the consumer education areas as defined by NAEP. For example, in economics the following question appeared: "Of the taxes the federal government collects which tax provides the most revenue?" (NAEP, 1979, p. 7). A few items were hypothetical situations which required students to draw conclusions concerning consumer behavior. Other items required respondents to make a consumer decision in light of given situations, but none of the representative items published in the NAEP 1979 document assessed aspects of the processes involved in making consumer decisions. Nor did the items present examples from real warranties, contracts, advertisements, etc., and have subjects ascertain the most valid sources of information and make decisions in light of possible consequences. Once again, the items appear to assess prior factual knowledge instead of the decision making process related to consumer economics. Reading skills, which should be incorporated into this decision making process, are ignored for the most part.

According to Schoenfeld (NAEP, 1979, p. 53) ". . . in my view the objectives of consumer education should be to develop hesitancy on the part of the individual before s/he takes any action or makes any decision. This would be followed by a thought process wherein the options and the consequences of those options are considered before determining a course of action." Apparently some tests of consumer education do not consider the processing of information through reading, nor do they assess the decision making processes. Yet both reading and decision making processes are inherent in formulating wise consumer decisions.

Like the NAEP, APL, and other studies of consumer education, the schools, too, have tended to focus on knowledge acquisition rather than on developing critical thinking and decision making skills. (Indiana Project for Consumer and Economic Education Guidelines, ND, p. 6). Early efforts related to consumer education in schools were usually relegated to junior and senior secondary students (sometimes the non-academic student) and fragmented between courses in the social sciences, home economics, and business education. Such instruction usually ignored a practical application for consumers in the marketplace. (Indiana Project for Consumer and Economic Education Guidelines, ND, p. 1)

Although numerous definitions of consumer education exist, for purposes of this paper consumer education has been defined as follows:

> Consumer education is multidisciplinary and draws on concepts from economics, social science, business, mathematics, and home economics. Consumer education is the study of the knowledge, skills, and understandings needed by individuals and groups to manage effectively consumer resources and to take actions as citizens related to daily and ongoing consumer decision making. Reading is recognized as a needed skill in consumer decision making. Consumers must consider the value, content, and validity of information sources – some of which appear in print – in order to achieve maximum satisfaction through the responsible use of available resources.

The consumer must gather information from both print, e.g., purchase agreements, consumer reports, and non-print sources, engage in some comparative analysis of the information, synthesize the results of both information gathering and analysis, and then make a decision from among the vast array of consumer goods and services.

An adapted form of Wentworth's (1976) comments related to economic literacy and efficacy provide insight into the prerequisite reading and reasoning skills needed to make effective consumer decisions. A literate consumer:

(1) can use/read economic terminology (vocabulary).
(2) can recognize the personal/family costs and benefits of making a particular purchase.
(3) will consider opportunity cost when deciding on a purchase.
(4) can distinguish between conclusions reached on the basis of empirical evidence found through reading various consumer related materials versus conclusions reached on the basis of desire, rumor, or other preconceptions.
(5) can draw conclusions after reading about the projected purchase and make choices consistent with those of wise consumers.
(6) can use logical reasoning to develop a conclusion.
(7) has the reading skills appropriate for reading contracts, purchase agreements, warranties, etc.
(8) recognizes that any judgment made on the basis of limited information is potentially inadequate and realizes that judgment may be subject to possible revision if new information becomes available.

Effective use of these skills underscore the importance of reading and reasoning skills development in order to make effective consumer decisions from among several possible alternative decisions.

Consumers must also recognize that economic relationships are intertwined with political, social, cultural, and technological changes. These changes modify the goods consumed and mode of exchange between consumers and producers. In fact, the growing interest in consumer education is itself a product of change in the economy and society. The need for ongoing consumer education and growth of consumer awareness have generated "Consumer Reports" and "Wise Buying" columns in newspapers and magazines.

Understanding basic economic concepts and principles is central to effective consumer decision making. Consumers need knowledge of the economic system and its functioning. Consumer education needs to include the study of the consumer's role as an individual and as a member of society in a variety of settings. Today consumer education is to help students gain ". . . competence in the knowledge and skills needed to make decisions and take actions as informed and responsible consumers in a broad range of consumer behavior modes" (Bannister & Monsma, 1980 p. 11).

The authors have developed a "Consumer Decision Action System Model" which suggests a complex relationship between the individual and related external and internal factors. The model considers socio-economic and information areas which influence the context in which decisions are made. Social and individual goals and values are also factors which determine consumer actions and decisions. The model also shows that the decision making process and the decision product/outcome are predicated on reading and reasoning skills.

A discursive account of the system must begin with the external and internal environments as shown in the model. The external environment is composed of two sub-systems, the socio-economic and the information sub-systems. The socio-economic sub-system includes the economic, political, social, ecological, and technological systems or influences which operate on the individual (Bannister & Monsma, 1980). The information sub-system includes print and non-print media, oral and sign language, and experience with the world. While these areas often co-occur, they have been isolated in the model for the purpose of illustration. The information sub-system, as shown in the model, provides the mode of access to the socio-economic sub-system. For example, in the main, the political system is not immediately experienced by groups or individuals; rather knowledge of and involvement with the political arena are mediated by print and non-print informational sources.

Personal factors are main components of the internal environment. These factors include an individual's resources, place in the life cycle, prior knowledge, and affect. Resources refer to physical, emotional, financial, and cognitive aspects of a person. Prior knowledge is that information which is assimilated by the individual and is fit into pre-existing schemata. The intended meaning of affect is exemplified in the taxonomy created by Krathwohl, Bloom, and Masia (1964). All of these personal factors are given expression in the form of needs and wants and lifestyle preferences of the individual. The internal and external environments are related through processes of socialization, individuation, interaction, and tension. With respect to socialization and becoming an individual Habermas (1979, p. 109), McCarthy (1978, pp. 335-7), and others have suggested that the socio-economic sub-system presents various roles which are transmitted to the child largely through the family. The information sources aid in reinforcing those roles.

The internal environment effects socialization in that people are not simply role takers but are active creators of the roles they play. Personal factors, as shown in the model, influence people as they create their roles. Thus, people are socialized through a variety of means yet these processes operate in such a way as to make each of us an indivdual.

Simultaneously, the multiplicity of individuals operating within and through groups will change, maintain, and effect the socio-economic and information sub-systems. Changes in personal factors, when they occur at the same time in a large number of individuals, will have an effect on the external environment. As the model shows, the interaction between external and internal environments is mutually operative. Interaction, then, refers to the continual dynamic of exchange between internal and external environments. And interaction is such that priority can be given to neither external nor internal environments. Each acts continually on the other.

Tension exists between the external and internal environments. The external environment exerts pressure on the individual to conform. This pressure can come from the peer group, from advertising, or any number of other sources. Such pressure to conform can be experienced as a lack, in which case the individual comes to desire the object or circumstances presented by the external environment, or it may be experienced as an unwelcome intrusion, as a demand to be resisted. In either case, the relation between internal and external environments is characterized by tension.

The context for consumer behaviors indicated in the model are the consumer decision action areas (Bannister and Monsma, 1980, p. 10). These consumer decision action areas include resource management and citizen participation. The consumer decision action areas may be "pushed" or constrained through both the external and internal environments. The goals and values generated from the internal and external environments act as mediators on the consumer decision action areas.

Decision making, as implied in the model, involves formulating rational choices regarding an event, action, object, or idea of some importance to the consumer. These reasoned choices reflect the values of the decision maker and are based on the acquisition of adequate and correct data as well as on existing alternatives (Cassidy & Kurfman, 1977, p. 1). Although the printed word is usually the primary means of transmitting consumer information (Williams, 1976, p. 22), decisions are often made on the basis of impulse, peer pressure, from habit, or by default.

Decision making processes have been examined by scholars in several disciplines and from different perspectives. In general, most scholars would agree that decision making involves seeking answers to three fundamental questions: (1) What is the problem to be solved? (2) What alternatives are available? and (3) Which alternative is best at this time? or What are the consequences of this choice?

The response to question one requires identifying the issues to be decided and clarifying the goals to be achieved when the final decision is made. In order to answer question two, the decision maker needs to identify the alternatives available. At this point the consumer may be drawing on prior knowledge, gathering additional printed information, and comparing analogous situations. The effective use of the gathered data encourages both practice and creative consideration from among several possibilities. The greater knowledge available to the decision maker, the greater the possibility of alternatives. Limited knowledge implies fewer alternatives available to be used in the decision making process.

The final phase of the process examines and evaluates possible alternatives which are compared for short and long term gains and consequences. Here the values of the decision maker are emphasized and conflicting multiple values, priorities, and competing goals are reconciled. A commitment to take appropriate action is implied as is a willingness to assume responsibility for those consequences and actions. At this point the consumer selects the most appropriate alternative. This is the consumer decision/action.

Drucker (1967) suggests a particular decision is not viable unless the decision can be implemented. After implementation of a decision, the decision maker should analyze, review, and evaluate the decision and, if necessary, re-enter the decision making process at the appropriate place. This evaluation is an important aspect of decision making since future decisions may be influenced by previous decisions. While the decision making process is time consuming, the returns on the time investment result in more efficient and effective decisions.

Resnick (1976, p. 79) has suggested a model of problem solving which bears some similarity to the decision making model proposed in this paper. The Resnick problem solving model has three interacting phases. During the first phase the problem is identified. In the second phase the "task environment" is scanned for cues to appropriate responses. The third phase consists of "... goal analysis in which goals are successively reformulated partly on the basis of external task cues, in order to yield soluble sub-goals that contribute eventually to solution of the task presented" (Resnick, 1979, p. 79). Both the decision making model in this paper and Resnick's problem solving model indicate that the problem must be formulated, the alternatives must be recognized, and goals or alternatives must be created prior to reaching the solution or decision.

As Cassidy and Kurfman (1977, p. 7) note the decision making process is not usually linear but takes into account "... subjectivity, intuition, individuality, and ... values." Needed skills are interrelated and used in various ways throughout the decision making process. Five overarching skills categories important for consumer decision making have been identified.[1] These skills, not necessarily unique to consumer education, can be taught in reading, social science, and other curriculum areas. The skill categories are given below.

1. FACILITATING SKILLS provide the foundation framework for basic skill development in consumer decision making. Observing, classifying, sequencing, defining terms, and recognizing spatial relations are fundamental skills. Reading, for example, cannot take place unless the student has developed these prerequisite skills.
2. CONCEPTUALIZING SKILLS require the formation of a mental image of a concrete object, type of behavior, or abstract idea. A concept described by a word or phrase conjures an image which can be used to provide insights into the organization of data. Conceptualizing involves collecting, grouping, and labeling information.
3. PROCESSING SKILLS include weighing information, comparing and contrasting, formulating questions and hypotheses, inferring, predicting outcomes, testing hypotheses, and gathering and compiling information from various sources.
4. OPERATING SKILLS require interpretation of graphs, charts, etc., valuing and judging, searching for cues in the environment, communicating, and social interaction.
5. REASONING SKILLS presuppose development in the preceding skills categories. Reasoning is the attempt to reach a conclusion about some event, action, object, or idea. Effective use of reasoning depends upon the ability to form deductive, inductive, and analogical arguments.

Reading skills which should be applied during the decision making process will vary according to the nature of the text material available and according to the reader's ability. The skills required in a given consumer situation, the reader's abilities, and the interaction between them can be productively approached through the theory of metacognitive activities described in Otto, White, and Camperell (1980, pp. 60-73). Metacognition is the explicit and/or tacit awareness one has of one's cognitive activities and the application of those processes to achieving understanding, problem solving, etc. The decision making process as described in the present model demonstrates an instance in which metacognitive activity should occur.

There are three specific aspects of metacognitive activity which have implications for consumer decision making and reading. The first aspect of concern is the reader/decision maker's knowledge of the type and depth of cognitive processing which is appropriate for reading particular types of consumer documents. A second type of metacognitive activity includes the *task variables* which involve the reader/decision maker's ability to assess the relative difficulty of a consumer related document or decision. The amount of reading required for the informed comparison of two commodities or the nature of the related text material could cause problems if improperly assessed by the reader/decision maker. *Strategy variables,* a third type of metacognitive activity, are those processes an individual should use to solve a consumer problem. For example, absence of knowledge about which strategy to apply during consumer decision making can lead to unwise and perhaps impulsive consumer actions. In addition, the reading strategies which should be used during the decision making process must be determined and judiciously applied by the consumer.

Brown (1977, as cited in Otto *et. al.* 1980, pp. 63-64) has specified several examples of reading behaviors which she believes involve metacognitive decisions. These behaviors, when adapted for the purpose of consumer decision making, are as follows:

a. Clarifying the purpose for reading in light of the consumer problem. As Brown suggests, the reader must understand the stated and unstated requirements of the task. For example, the wise reader/decision maker must recognize that comparisons of commodities should be made and later alternatives must be evaluated in terms of their consequences.
b. Recognizing the important aspects of the consumer problem and of the supporting reading material.
c. Focusing attention and concentrating on the salient aspects of the consumer problem and accompanying reading material.
d. Assessing or monitoring ongoing activities as they occur so as to ensure success. For instance, as the reader/decision maker proceeds through the decision making process, s/he must recognize the requirements of each step of the process as that step occurs. The reader, too, must recognize whether s/he has succeeded in comprehending as s/he reads the necessary purchase agreement, etc.
e. Using self-questioning, inherent in the decision making procedure, to determine whether or not each part of the process is in fact being met. Self-questioning and review, retrospective activities, are also necessary after reading consumer related documents to ensure that all relevant data have been gathered prior to weighing alternatives.
f. Making adjustments when the consumer fails to complete any part of the decision making process. The reader must also switch reading strategies if comprehension failure is detected during or after reading consumer related documents.

The authors are suggesting that teachers make these metacognitive skills, which are important for reading and consumer decision making, explicit through the use of consumer dilemmas. These dilemmas have instructional value in that students are taught *how* to make consumer decisions through the use of reading consumer content materials. Simutaneously, the students will utilize self-monitoring strategies in the processes of consumer decision making and reading as they solve consumer dilemmas.

The dilemmas are short stories written at the grade and interest levels of a particular audience. In each dilemma the protagonist is confronted with a problem consumers typically encounter. An authentic consumer document (e.g., a charge account and security agreement) and possibly readings from a respected consumer magazine accompany each dilemma. Prior to reading students give a confidence rating to reading material indicating the ease or difficulty of the printed material for them. Question sheets designed to encourage students to reread specific parts of the written material are included with each dilemma and consumer document. Finally, students proceed through the steps of the decision making process. During the process, students create and complete their own decision making matrix composed of the alternatives, and the gains and consequences of each alternative. Students state the decision they have reached on the basis of available data and then evaluate their decision.

Wise consumer decision making is vital both for the quality of the decision maker's life and for the potential effects consumer decisions have on society. In this paper the authors have proposed a model which clarifies the decision making process and the factors which influence the process. Effective use of reading and reasoning skills inherent in consumer decision making presumes that such skills have been identified in the curriculum and taught in school. Consumer dilemmas when used in various content areas provide an excellent vehicle for teaching these basic life skills.

The metacognitive activity involved in reading consumer related documents and in decison making can be supported, taught, and made explicit through the use of consumer dilemmas. In addition, specific vocabulary, comprehension, and consumer decision making skills can be taught through this type of learning activity. Students engaged in these and similar instructional activities should learn to become skilled readers and competent consumer decision makers.

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[1] Definitions have been adapted from the following sources: Carpenter: 1963; Goldmark: 1968; Simon: 1970; Fair & Shaftel: 1967; Taba: 1971; Hartoonian: 1979; and Michaelis, *et. al:* 1968.

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MULTI-DISCIPLINE ANALYSIS OF SUBVOCALIZATION EFFECTS ON COMPREHENSION

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Subvocalization is an activity which cuts across disciplines. It occurs while students read in science, social studies, and English materials. It is pervasive, yet not understood. Furthermore, it is a language behavior which has been a subject of controversy in the discipline of reading for many years. Some educators' views reflect Huey's thinking (1908):

> There can be little doubt that the main meaning comes to consciousness only with the beginning of the sentence utterance, and the reader does not feel he has the complete sense until he has spoken it. He is almost sure to deliberately say the passage over to himself if it is difficult and persons who do not read very much must usually use an actual whisper, even in easy reading, if the meaning is to be obtained. (p. 147)

The opposite viewpoint, that subvocalism is detrimental to the reading process, can be traced to proponents of the silent reading method which emanated from the discovery that silent reading was faster than oral reading (Buswell 1945).

Currently, most authorities agree that subvocalism does occur among readers of all ages. In addition, it is widely regarded as a negative phenomenon (Bond and Tinker 1973, Ekwall 1970, Spache 1976, Smith 1978) in spite of a growing body of evidence to the contrary.

In a recent search of the literature, covering the years from 1966-1981, relating subvocalization to reading and language comprehension, there were approximately one hundred fifty studies reported. Generally, these studies can be broadly classified into the following four areas: 1) subvocalism and its incidence in early childhood language behavior, 2) the relationship of subvocalism to rate of reading, 3) the effect of feedback and suppression of subvocalism on related language behaviors, and 4) verbal mediation and its impact on cognitive behaviors.

While the literature search clearly indicates that there has been a great deal of research conducted on subvocalism during reading and other related language behaviors, there has been no definitive attempt to summarize and synthesize the research in this area. The purpose of this paper is to examine a select group of reports which were prominent in the four areas mentioned in order to: 1) identify the current state of knowledge about subvocalism, 2) clearly delineate what implications there are for teaching in developmental programs, remedial programs, and in content reading, and 3) suggest what future directions research in this area should take.

CURRENT STATE OF KNOWLEDGE

Subvocalism and Language Development

There have been a number of investigations which have reported on the incidence of subvocalization among young children performing different language tasks. Amodeo (1975) investigated one aspect of developmental progress in language acquisition, "private speech" (a form of subvocalization), especially as it relates to monolingual and bilingual children. All the children exhibited private speech. There were differences in the quantity of subvocalization and the differences indicated that bilingual children exhibit less private speech than monolingual children. Dickie (1973), in an earlier study which focused on private speech reported that 1) more private and social speech occurred when peers were in the room than when parents

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were there, and 2) more private speech occurred during free play than during a structured task.

Garrity (1973) investigated the relationship of subvocalization to recall on short term memory tasks. She found that 1) subvocalization and short term memory were significantly correlated, 2) the correlation between subvocalization and short term memory was higher for boys than for girls, and 3) finally, subjects who subvocalized most had significantly higher recall scores than subjects who subvocalized the least. In a subsequent study (1975) involving the levels of subvocalization as related to picture presentation and verbal tasks she found that the amount of subvocalization is significantly related to the amount of recall. She also found that younger, slower children subvocalized less than older, brighter children. Furthermore, Garrity (1977) while conducting research on subvocalization and short term memory, noted that preschoolers as young as age four engaged in spontaneous subvocalization.

Ringwald (1978) conducted an investigation which focused on the role of subvocalization in short term memory as it relates to beginning reading instruction. She found that the high correlation between memory tests, reading test scores, and subvocalization is a significant predictor of reading ability at the beginning stage. She reported also that the combination of mental age and subvocalization was a significant predictor of reading at the beginning stage. Uchida-Nobuko (1955), while working with a group of five year olds, found that both internal (subvocalization) and external verbalization facilitated learning and sentence comprehension. Locke and Fehr's investigation (1970) of speech code and recall among four and five year olds led them to conclude that the nature of an individual's short term memory is shaped to some extend by the phonetic characteristics of the implicit response to the material. They suggested that a critical function of the speech code is that of mediating the environment.

Subvocalism and Rate of Reading

A major thrust of subvocalization research over the years has centered on gathering empirical data on the effect of techniques designed to reduce or eliminate subvocalization. Researchers who considered subvocalization detrimental to the reading process because it was viewed as a deterrent to rate of reading used delayed auditory feedback (DAF) and biofeedback training to decrease subvocalism. A major issue that appears to have been overlooked by the critics of subvocal activity is the differences in the various levels of the activity itself as identified by Edfeldt (1960):

1) Saying or loud whispering of almost every word.
2) Faint whispering of many words.
3) Pronounced lip movements but no sound.
4) Faint or no lip movements, no sound, but sufficient movements of the tongue to be felt by the fingers under the lower jaw.
5) No sound, no movements of lips or tongue, but movements in the throat perceptible to the fingers if placed on the throat.
6) No sound, no movements of lips or tongue or in the throat directly perceptible to an observer, but movements which can be registered by means of electromyography.

Oviously, the first two levels which actually involve production of speech would limit rate of reading to an oral reading rate. The next two levels involve lip movement, but no sound could presumably occur at a somewhat faster rate. The last two levels involve little motor activity. Therefore, it seems reasonable to assume that rate would be faster.

Verification of this theory appears to have been provided from research by Laffey (1966) which showed that rate of subvocalization increased parallel to rate of presentation by machine until a saturation point was reached. In addition, Feldman's research (1974) showed that rate of subvocalization increased as rate of silent reading increased. In fact, silent readers produced the most speech muscle activity. This nullifies Smith's contention (1978), which, incidentally, was not supported by empirical data, that silent reading is too fast for subvocalization to occur. Riley and Lowe (1981) also concluded that subvocalization is not related to rate of reading after unsuccessfully attempting to reduce or eliminate it through biofeedback training.

It would appear that both the rate of reading and the rate of subvocalization adjust according to the difficulty of the material, decreasing as the material becomes more difficult to understand and increasing as less difficult material is read. In other words, difficulty of the material is the apparent determinant of rate of reading as well as rate of subvocalization.

Suppression and Feeback

An important aspect of the suppression research, which is critical in terms of understanding the role of subvocalization in reading and language comprehension, deals with its effect on short term memory. The researchers who used delayed auditory feedback or had subjects count aloud during reading have reported that either 1) the suppression of vocalization did not have a detrimental effect on comprehension (Bergering 1975, Colle 1973, Ferrara 1977) or 2) that the suppression of subvocalization did in fact interfere with comprehension (Donovan 1977, McGuigan 1973, Cole and Young 1975, and Wells 1976).

While the argument can be made that having subjects count aloud while reading would cause direct interference in comprehending the printed message, other research which contends with a related issue, that of determining what happens when subvocalization is permitted to occur naturally without any attempt to suppress it in any manner, clearly suggests that it aids in short term memory and reading comprehension. McGuigan (1974) indicated that subvocalization facilitated the reading proficiency of college students. Izzo (1975) found that an increase of subvocalization in his subjects increased comprehension. Keeny et. al. (1967) utilized verbal rehearsal training with six and seven year olds which resulted in improved recall scores.

Verbal Mediation – The Integrative Factor

While subvocalism has frequently been considered as a kind of undesirable behavior which either inhibits effective reading or has a serious detrimental effect on such cognitive behaviors as reading comprehension, some writers view subvocalization as an essential mediation strategy which connects print and language. According to Laffey (1966), one indication of the significance of oral reading to successful silent reading is the role that vocalism or covert language plays in the silent reading process. It is well known among reading educators that when a person encounters difficult material and wants to understand that material, he/she will often read the material so that some voice mechanisms can be heard or observed by others viewing the person reading silently. In any attempt to retain information, an individual, at whatever level of reading, will often read the material both silently and orally, so that the material is processed consciously and overtly through the language center of the brain, in both the auditory and visual channels. Furthermore, it is not only a matter of retention when considering vocalism during silent reading, but also a matter of basic understanding. When a person wants to be sure that he is understanding an idea or concept, he will attempt to process the language through both channels again, thus, enabling him to understand the concept as he is reading silently.

Aarons (1971) conducted an experiment with a group of mature readers who were classified as high or low subvocalizers and concluded that theoretically subvocalization "may amplify meaning in the externally directed thinking of reading." Hardyck and Petrinovich (1970) concluded that subvocal speech is a useful stimulus to mediate cognitive responses. Levy (1975) while investigating the question as to whether phonemic or auditory processing is beneficial during reading worked with over 150 high school and college students in three experiments and found that 1) speech-motor activity during reading plays a useful information-processing role, 2) suppressing subvocalization by asking students to count while reading dramatically depresses retention, and 3) that the auditory channel was superior to the visual channel in processing information. This author viewed these findings as indicating that the suppression procedure is one in which the speech activity usually associated with the comprehension process is prevented from operating naturally as it does when a reader subvocalizes while reading silently. Essentially, then, subvocalization as viewed and described in these studies is the mediational bridge that connects printed symbols to the cognitive processing of language. This view, of course, is different from that of the psycholinguists who contend that reading is a matter of going from print to meaning without any mediational step.

Tarver et al (1977) provides further enlightenment on the role of subvocalization as a mediational strategy. These researchers conducted an experiment which supported the hypothesis that selective attention deficits in children with learning disabilities, as well as inadequate verbal rehearsal strategies, as compared to the strategies employed by typical children, represent a developmental lag rather than a more permanent defect in learning and/or information processing. This is consistent with Hagen's (1975) viewpoint that selective attention develops with age and is particularly relevant to the notion that verbal mediation strategies facilitate the development of short term memory (Belmont and Butterfield 1971, Bristow 1976, Ellis 1970) and selective attention (Hagen and Kail 1970). Furthermore, since these two aspects of information processing are thought to be basic psychological processes upon which all higher levels of cognitive processing are dependent, there is a resultant developmental delay of higher levels of cognitive functioning among learning disabled children. It is important to note that subvocalization is viewed as a key verbal rehearsal strategy reported in this study. Flavell et al (1966), who also viewed spontaneous verbal rehearsal in memory tasks as a function of age, suggested that verbal rehearsal requires certain intellectual competencies and a demonstration of sustained attention. He noted a continued increase in verbalization from 2nd to 5th grade.

According to McGuigan and Winstead (1970), the phonetic code facilitates semantic processing and subvocalization aids efficient processing by serving as the mechanism for retaining information from long term memory. This is particularly enlightening when considered with Perfetti and Goldman's contention (1976) that short term memory capacity is not as important as the efficiency with which it's used. Subvocalism would appear then to develop the capacity of short term memory, as indicated in research discussed earlier, and promote efficiency of its use as well, by facilitating the retrieval process.

Oral reading, the overt form of subvocalization, serves as verbal mediation with reading disabled students. The use of oral reading techniques on a regular basis resulted in statistically significant gain scores in a number of studies (Laffey, Kelly, Perry 1980, Laffey and Kelly 1981, Negin and Rios 1980, Title I Report 1981—in preparation). Perhaps the effectiveness of this verbal mediation strategy can be explained when one considers Farnham-Diggory and Gregg's (1975) research which showed that poor readers have an asynchrony between the auditory and visual channels. Obviously, verbal mediation would tend to have a synchronizing effect. The researchers concluded that the attentional control mechanisms for the reading process were vested in the auditory channel.

Lassen (1978), while investigating brain blood flow activity during silent and oral reading, observed that "it is now apparent that during a (neurological) test involving a specific type of function (i.e., speaking, thinking, listening) there is a local change in nerve-cell activity and hence in metabolic rate that gives rise to an increase in blood flow in the active (brain) region." Furthermore, he states later in his paper "the resting pattern of blood flow in the brain of a normal subject is highly characreristic and reproducible and it serves as a point of departure for the interpretation of the functional patterns recorded during different types of sensory, motor, and purely mental activity. With this information as the logical and empirical bases of his investigations he noted that reading silently and reading aloud involved different blood flow patterns of activity in the cor[illegible]. Reading silently activated four cerebral cortex areas: 1) v[illegible] association area 2) the frontal eye field 3) the supplementary motor area and 4) Broca's speech center in the lower part of the frontal lobe. Reading aloud, on the other hand, activates these four regions plus three more centers: 5) the mouth area 6) the auditory cortex and 7) the primary visual cortex. What appears to be exceptionally significant about this neurological data is that subvocalization has been noted as a technique that inividuals use to provide auditory feedback as a rehearsal strategy. Also important to note is the reality of Broca's speech center functioning during silent reading. This pheomena would seem to lay to rest the notion that it is possible, while reading, to go from print to meaning. Since Broca's speech center is functioning during silent reading, this clearly suggests that reading is a matter of going from print to oral language (speech) to meaning. Further arguments to support this point of view come from the work of Aarons (1971) who notes that speech is a complex skill with auditory and kinesthetic components. In reading vision, speech and its auditory, kinesthetic and sensory motor components coordinte intermodally and intramodally all of these complex elements. It seems reasonable then to suggest that subvocalization is an unconscious and sometimes conscious technique readers use to not only integrate these complex elements but also use it as a verbal rehearsal strategy. This latter activity appears to fit within Osgood's mediational hypothesis which describes the visual, auditory, and motor sensory integration as a basis for verbal learning or "mediating reaction" which seems to be a psychological construct that can be used to describe subvocalization. A final bit of evidence that offers enlightenment on both the neurological processes and their integration during reading has been offered by Brown (1979)(. He noted the existence of neurological activity in the speech center of the brain during CAT scans of the brain during silent reading when no recordable subvocalization was taking place. Again, this seems to highlight a continuum of activity during the process of relating print to oral language to meaning.

CONCLUSIONS AND IMPLICATIONS FOR TEACHING

The authors of this paper have synthesized the results of a wide variety of investigations of subvocalization as it relates to language behaviors. The importance of the synthesization lies in the patterns suggested by the results of the investigations, the tentative conclusions which can be drawn based on those patterns, and the implications of the conclusions for instructional programs:

1) Subvocalization is a natural speech related adjunct to reading which is part of the process of internalizing the phonetic code. The internalization of the code provides for automatic processing of phoneme/grapheme correspondences, thus, freeing attention for comprehension.

2) When the reading task requires some type of recall activity, subvocalism should be encouraged as a type of verbal rehearsal, particularly with remedial students.

3) Efforts to suppress subvocalism should be discontinued especially among disabled readers since research clearly indicates that it enhances comprehension.

4) In content classrooms, greater emphasis should be placed on encouraging students to vocalize or verbalize the technical language of the subject matter. Content teachers need to be informed of the role of subvocalization in the reading process as indicated by the wide body of research reviewed for this paper.

RESEARCH DIRECTIONS

An analysis of the recurrent patterns of results in the investigations suggests that future research in a number of areas would lend further clarity to the role of subvocalization in the reading process:

1) Student populations with various types of deficits should be investigated including those who have demonstrated: (a) developmental lag, (b) asynchronous modalities, and those that give (c) evidence of a lack of internalization of the code.

2) Investigations of brain function during reading should be an area of emphasis in subvocalization research, particularly with the following procedures: (a) blood flow monitoring and (b) CAT scanning.

3) Longitudinal research focusing on different strategies for helping students to internalize the code, particularly those which include subvocalization as an overt method, should be conducted. At least these three techniques should be used: (a) verbal rehearsal strategies, (b) listen and read techniques, (c) repeated readings.

4) Research that deals with clarifying how phonemic encoding acts as the bridge between short-term memory and long-term memory is especially needed.

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WHAT RESEARCH SAYS TO THE DISCIPLINARIAN

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The noted social scientist, Albert H. Burrows (1961), briefly defines a scholarly discipline as any organized body of knowledge in a given field, and categorizes the scholarly disciplines under two broad headings: Sciences and Non-Sciences. Disciplines under discussion fall into both categories. The interrelatedness of these fields is well known. For example, the sciences of physics and mathematics are drawn upon for the technological discipline of a school of engineering or school of industrial arts; and the sciences of biology and chemistry are drawn upon for materials from which to organize the technology of a school of medicine, nursing, and other healing arts. Similarly, sociology, as a social science, is also a technology as it involves the principles governing group interactions and the effect on the behavior of the individuals and groups participating in them; thus, social service is the applied phase of sociology.

Scholars in the scienes and non-sciences express the belief that there is no substitute for the highly trained disciplinarian, and that in order to become a scholar in any field, one must possess a high level of reading comprehension. Almost four decades ago, Hall and Robinson (1945) reported one of the few analytic studies of the relationship between tests of general reading ability and reading in such disciplines as history, geology, art, and fiction. They identified at the college level the following reading skills: attitude of comprehension accuracy, word meaning, rate of inductive reading, rate for unrelated factors, and chart-reading. Both concluded that reading skills for prose and non-prose were different.

More recently, however, Shepherd (1963) pointed out that reading per se has no content of its own, and must draw from the subject matter disciplines. Therefore, in order to comprehend the materials, one must have a set of reading skills common to all disciplines and also a set of skills peculiar to each discipline. Muelder (1966) agrees with this position, and cites, for example, mathematics as requiring extensive and intensive reading, since data are cumulative with knowledge building on other knowledge, and the student must get complete understanding as he progresses in the subject matter. "Because a single word may change the whole meaning in mathematics," says Muelder, "every single word is crucial." This may not be true in social science.

In the field of science, the student is lost if he does not see the organization of information, classification, sequence, explanation of a process, detailed statements of fact, the main idea, details as they relate to the main idea, or is unable to make inferences, and accurate generalizations. In fact, each discipline contains a technical vocabulary which the student must master, if he is to become competent in it.

This review addresses the question: What do we know about the relationship of reading comprehension as measured by standardized test scores to grade point averages of students in engineering, business, mathematics/science, in sociology, and history? Efforts to uncover systematic replications of studies to support theoretical constructs on the predictive validity of standardized reading tests to grade point averages were practically futile. However, the literature contains numerous studies in a combination of disciplines which may or may not duplicate the exact subjects under consideration here.

Grade point average in this review is used as the criterion variable. Both Anastasia (1968) and Lanvin (1966) suggest that academic performance, as indexed by grade point average (GPA), is subject to analagous difficulties, not only because of the subjective criteria that may enter the grading process by different teachers, but because of the uncontrolled sources of variation in or across disciplines. Lanvin (1966) goes a step further to question whether it is meaningful to compare averages of students across disciplines, suggesting that it might be more appropriate to study the determinants of performance within subject matter disciplines. Nevertheless, researchers continue to utilize linear correlation and multiple-regression procedures in their studies.

Citing both the College Ability Test (CAT) and the Scholastic Aptitude Test (SAT) as examples of predictive tests now being subjected to widespread debate and criticism, Bracey (1980), Wickenden (1980), and Stanley (1981), while acknowledging that high school grades have always been a better predictor of academic success in college, suggest that the SAT does in fact predict first year GPA's with the average correlation usually given as .41.

Stanley (1981) of Johns Hopkins bases his faith in the SAT on scores of thousands of precocious youngsters who entered his mathematics programs from junior high school, and who are now—at age 17-18—undertaking Ph.D. degrees at Rutgers, Stanford, Columbia, etc. "The SAT predicts rather well," said Stanley, "which students can move ahead successfully at a fast pace in subject matter too difficult for the typical youth their age." (p. 10)

A report by Slack and Porter (1980) of Harvard casts serious doubt on the foregoing assertions. Their data in eleven studies indicate that the predictive contribution made by the SAT is indeed small, and that superior predictions can be made from a combination of grades and achievement tests. In commenting on the use of tests as predictors of GPA's, Anastasia (1968) contends that no distinction between aptitude and achievement tests can be rigidly applied, since both types are highly verbal in nature. She further states that the STEP, ACT, OSUPT, MAT, and the ITED all sample a combination of general aptitudes and knowledge about subject matter in the major disciplines. Within this general framework, then, the studies reviewed below attempt to answer the question: Do standardized test scores predict GPA's of college students in various disciplines?

STUDIES INVOLVING TESTS AS PREDICTORS OF GPA'S

The specific objective of a study undertaken by D'Amico, Bryant, and Prahl (1959) was to determine how well the Multiple Aptitude Test (MAT) correlated with grades in junior college subjects. Test results of 450 students at Flint Junior College and their subsequent grades provided the data for the study. Means, standard deviations, Product-Moment Correlations, and Multiple Correlations were computed. The results showed a range of single validity coefficients varying from -.01 to .73. Additionally, the Verbal Comprehesion Factor contributed significantly to prediction of academic success in Biology, General Business, Psychology, English Composition, Foreign Language, and Drawing; while Test 6, Arithmetic Computation, contributed significantly to the prediction of success in Mathematics, Accounting, Social Sciences, and Business Mathematics. GPA's in each of the subject areas approximated the letter grade of "C," with the standard deviation varying from .97 in Drawing to 1.7 in Psychology. Thus, D'Amico and associates (1959) concluded that MAT scores have from moderate to high validity in relation to achievement in junior college subjects.

During the same year, the Iowa Silent Reading Tests, Advanced Form, were among the seven predictors of GPA's of freshmen nursing students at the Trumbull Memorial Hospital in Warren, Ohio in astudy by Garrett (1960). Other predictors in the study were: Ohio State University Psychological Tests, Form 21; George Washington University Test Series: Arithmetic Test for Prospective Nurses, Fom 1; Minnesota Vocational Test for Clerical Workers; MacQuarrie Test for Mechanical Ability; Shipley-Hartford Retreat Scale; and High School GPA's. Multiple Correlations resulted in an 0.641 coefficient for High School Grades, the Iowa Silent Reading Test, the Hunt Arithmetic Test, and the Minnesota Clerical Test as being the most practical predictors in combination. Excluding high school grades, however, the most practical predictors of first year grades in this study include the Ohio State Psychological Test, the Hunt Arithmetic Test, the Iowa Silent Reading Test, and the Shipley-Retreat Scale, which together yielded a multiple R of 0.435.

Reid, Johnson, Entwisle, and Angers (1962) reported a study in which 410 freshmen at Newark College of Engineering obtained a verbal mean score of 493.3 on the SAT; verbal score of 39.3 on the CAT, Form I-A; and a Composite mean reading score of 28.1 on the Cooperative English Test, C-2. Those entrants obtained a higher mean math score on both the SAT (576.7) and the CAT (42.5) than on the verbal sections. The study failed to show a positive relationship between reading or math scores and GPA's, since 124 or 30 percent of the students were dismissed for unsatisfactory performance (GPA's of -1.25) prior to graduation. In fact, drop-outs at the end of the first semester fell significantly below the entering class mean in mathematics on the SAT, and CT as well as on the entering class mean on the verbal sections of both the CAT and the Cooperative English Test.

A study by Greenwood (1962) utilized the Buffalo Reading Test (BR); the verbal and quantitative sections of the ACE; the SAT; and the Engineering and Physical Science Tests as predictors of GPA's of 444 students who entered the chemical electrical, and mechanical curricula of the Broome Technical Community College, Erie County Technical Institute, and the New York City Community College of Applied Arts and Sciences. The highest correlations for the BR and GPA's was .60 and .70 for the Broome Technical Electrical Class and the Broome Technical Chemical Class respectively. No other correlations including the reading test were shown. The author recommended that each technical college develop its own predictors, separately.

Lepley (1965) used GPA's of entering freshmen to establish the predictive validity of the Synonym Vocabulary Test, Form I and Form II. The students were divided into four groups: liberal arts, engineering, science, and non-science. The results indicated that the range of inter-reliabilities between the two forms was from .82 to .90 with the four groups. In correlating the tests with GPA's, Lepley concluded that the usefulness of the tests was better for liberal arts students (Form I, .39; Form II, .38) and for science students (Form I, .46; Form II, .51) than for non-science and engineering students.

A total of 520 students comprised the sample from which Borup (1971) drew data concerning their ACT scores and first semester college GPA's among other variables. Analysis of Variance was computed to determine the amount of relationship between the variables. Comparisons of mean-quarter rankings of male and female students revealed that females exceeded the males in their high school achievement (2.11 vs 1.76), although males scored significantly higher than females on the ACT cumulative and the various sub-scores with the exception of the English portion. Males obtained a lower (1.93) first semester GPA than females (2.31), the F value being 25.69 with significance greater tan .05. Other variables were studied in this report such as sex and race. However, they are not germaine to the present study.

The predictive validity of three new tests with GPA's in selected courses was investigated by ABU-SAYF and George Za'Rour (1975) of the American University of Beirut. Tests were: The English Proficiency (ER), the Quantitative Aptitude Test (AQ), and the Science Proficiency (AS). The participants were 271 freshmen and sophomores enrolled at the University. Results showed that the EP Test predicted grades in English 201 at a higher level of accuracy than other English courses; AQ was found to be a valid predictor of grades in mathematics courses; and Form 886 of the AS Test proved to be a more valid predictor of GPA than was Form 885. Critical ratios between means suggested that science students performed significantly ($p < .01$) better than did the art students. In general, a low to moderate predictive validity for each of the tests was obtained.

Sherrell (1981) investigated the relationship of the N-D Reading Test total mean score and GPA's of 267 students enrolled in three Vocational/Technical Schools in Missouri, and found that as a group, they performed at a total grade equivalent of 10.9. Students in individual courses earned the following TGE's: Agriculture—9.5; Auto Body—9.1; Auto Mechanics—10.4; Electrical Engineering—12.3; Heating and Air-conditioning—10.0; and Licensed Practical Nursing (LPN)—13.5. Of the total sample, 48 or 18% earned A's; 109 or 41% earned B's; 86 or 32% earned C's; 16 or 6% earned D's; and 8 or 3% were dropped (perhaps earning F's). Sherrell complained that all textbooks used by these students had readability levels above the students' reading levels as measured by the N-D, and that the high scores made by students were due to the individualized attention, the use of supplementary reading materials, and teacher demonstrations.

Two final studies were reported by Geer (1981) and Jones (1981) in which different statistical analyses were made to determine the predictive validity of the N-D Tests for GPA's of their majors. In the Geer study (1981) a simple linear regression analysis was performed between Nelson-Denny total mean reading scores and GPA's for 141 LeTourneau College students in Engineering (65), Business (45), and Math/Science (31). Statistical significant correlations were found between GPA's and test scores (.37, .60, .66 respectively) in each discipline at the $<.01$ level, indicating low to moderate predictive validity of the Nelson-Denny Reading Test for GPA.

SUMMARY

This review has been concerned with a small sample of studies undertaken in four decades—from 1959 to 1981,—to assess the relationship of reading comprehension test scores to GPA's of students majoring in Engineering, Business, History, Sociology, Math/Science. Studies briefly reviewed include both single and multiple batteries of standardized tests as predictors of academic success as determined by grade point averages.

Of the thirteen studies mentioned only six showed moderate to high predictive validity of the tests involved; while seven showed little or no predictive strength for the tests.

Both Alexander (1976) and Walker (1981) concur with Lanvin (1966), Anastasi (1968), Astin (1971), Chansky (1973), and Baird (1979) in the belief that factors other than reading test scores have significant impact on predicting academic success of college students, and that test scores play only a supportive role in the matter of prediction. In fact, Lanvin (1966) and Glaser (1979) – more than a decade – later both expressed the view that efforts to improve predictive and diagnostic validity have run into diminishing returns, and hint that further progress may come only through systemtic theorizing about the determinants of academic performance. One implication, as seen by this author, is for replication by reading counselors usng identical tests, methodologies, majors, and (as far as possible), similar populations in similar colleges. Until this is done consistently, there is likely to be continued speculations and skepticism in the use of test scores as valid (sole) predictors of academic success at any level.

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PREDICTING GRADE POINT AVERAGES OF MAJORS IN BUSINESS, ENGINEERING, AND SCIENCE/MATH THROUGH THE USE OF READING COMPREHENSION TEST SCORES

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The reading program of LeTourneau College, though an important part of the college curriculum, does not serve every student on campus. The College's reading program focuses on entering freshmen students whose reading skills fall below the 13.0 grade level on the Nelson-Denny Reading Test A. The Department of English administers the test each fall and assigns students reading below 13.0 to the one-semester reading lab. Students scoring slightly above 13.0 are encouraged to take the reading course; some stronger students even volunteer to take the course primarily to improve their reading speed and vocabulary. Some of the students who are required to take the reading lab are also enrolled in a remedial English course on the basis of their ACT scores. Implied within the process of this testing and course assignment on the basis of reading scores is the basic philosophy of the Department of English that reading skills are important to a student's college career.

Situated in Longview, Texas, LeTourneau College is primarily a non-denominational Christian engineering college, with electrical, welding, and mechanical engineering options accredited by the Accreditation Board for Engineering and Technology. Science and math programs support this engineering emphasis as well as training their own majors in biology, chemistry, physics, and medical technology. The division of business is newer to the college curriculum than engineering, but it is growing rapidly in popularity with majors in accounting, industrial management and business administration.

As one might expect, the student body represents a great geographical diversity among its predominately male population. In the Spring 1981, every state except Nevada and Hawaii was represented in 899 students (131 from Texas, 87 from Pennsylvania, 64 from California, 59 from Illinois, and even 39 from Florida). Another 61 students came from 27 foreign countries (22 from Canada, 9 from Central America, 8 from South America, 6 from Africa, and 6 from Europe among the larger groupings). The total Spring 1981 enrollment consisted of 960 students, 856 male and 104 female.

Most of the students receive some economic aid in the form of National Defense loans, individual state loans, BEOG grants, and private scholarship funds. About 70 percent of the students work either through the campus work-study program or off-campus in a variety of Longview area businesses and industries. Most of the students are highly motivated, carrying an average of 15 credit hours in the Spring 1981, and involved in both campus and community programs and service projects. Over half of the students participate in the highly competitive campus intramural sports program.

The purpose of this research is to determine the predictive value of the Nelson-Denny reading scores in relation to the grade point averages (GPA) in the divisions of engineering, science/math, and business at LeTourneau College. The Nelson-Denny total scores were taken from Test A between the years 1977 and 1980. The Spring 1981 GPAs of declared majors in each division, predominately junior and senior students, were used.

Using extant scores, sixty-five students (2 female) in engineering, 45 students (6 females) in business, and 31 students (14 females) in science/math had available Nelson-Denny scores as entering freshmen and "declared major" status in Spring 1981. Because of the low percentage of females in each division, it was decided that sex was not a variable. Also, since all students who made below 13.0 grade level were required to take reading lab, it was not practical to do a correlation between those taking reading lab and those not taking it. In fact, only two students in engineering, two in science/math, and none in business who scored above the 13.0 grade level took reading lab on their own initiative. Nor was any correlation run between the divisions, since the results of such a comparison would be too ambiguous to be scientifically meaningful.

The basic assumptions which form the conceptual framework of the study are as follows:

1. The Nelson-Denny reading test accurately and reliably measures reading skills.
2. GPA accurately measures academic success.
3. Reading skill has a significant relationship to academic success.
4. Verbal skills are equally important in each of the three divisions (business, engineering, science/math).

On the basis of these assumptions, the following hypotheses were formulated:

Hypothesis I. The higher the total percentile Nelson-Denny reading score, the higher the corresponding GPA for each student.

Hypothesis II. The Nelson-Denny reading test significantly predicts academic success (GPA).

To ensure as much standardization as possible in the research, all of the students took strictly timed Nelson-Denny reading tests their first semester at LeTourneau College. The percentile total score was chosen for this research project rather than the grade level as a more accurate measurement of reading skill because the grade levels included too great a diversity of percentile rankings, especially at the 14+ grade level (67 to 99+ percentiles).

To measure the relationship between the Nelson-Denny total percentile reading score and the subsequent GPA for each student, a simple linear regression was run for each of the three divisions.

The results of a *t* test (see Table 1) indicate that this correlation between the Nelson-Denny total comprehension score and the GPA is significant in each division at the .01 level.

Hypothesis I. When one reviews the actual distribution of the individual scores, one discovers that there are individual exceptions to the actual norm. In other words, there are some students in each division who have scored above the Nelson-Denny mean precentile for each group, but whose GPA's have fallen below the group mean. Nevertheless, the hypothesis is accepted because engineering is .37; science/math is .66; business is .60. Surprisingly, business majors have the lowest mean percentile on the Nelson-Denny. One might have expected business students to have better developed verbal skills than engineering or science/math students. It may be, however, that they are merely less observant or less accurate readers on the whole. The proof of this notion, nevertheless, will be left to another study.

Hypothesis II. Because of the wide scattering of the data points ("noise"), one must exercise caution in using the Nelson-Denny reading test alone to predict academic success in terms of GPA. The Nelson-Denny is a significant tool, however, in predicting GPA. Because the test was timed, the predictive value may have been distorted. The timed test cannot account for the slow reader who is diligent in his studies nor for a fast, accurate reader who lacks either motivation or study skills. Yet the strength of the overall results indicates that the hypothesis is acceptable.

In conclusion, a word of caution must be given. Students are not highly predictive; psychological, emotional, and physical factors play as much a part in college success as do the mental factors of intelligence, knowledge retention, and literacy. Also, it is easy for the researcher to forget that each reading score represents a new student far from home, in a new environment, among strangers, who might have done better, or even worse in some cases, on another day, at a different time, or under other circumstances. For these reasons, perhaps, one finds a student with a mere 20 percentile Nelson-Denny total score making a 2.8 GPA. It is more difficult to account for the aberrant behavior of the student who scored in the 70 percentile on the Nelson-Denny, but who made a 1.7 GPA. For this reason, other tools may be better predictors. Nevertheless, these exceptions do not diminish the fact that the correlation between the Nelson-Denny total reading score and the subsequent GPA is highly significant, indicating that the test predicts, with reasonable accuracy, the potential academic success of an entering student at LeTourneau College.

	N	$\bar{X}$	Y	r
Business	45	59.33	2.72	.60
Engineering	65	64.22	2.82	.37
Science/Math	31	67.45	3.12	.66

N=Number of students
$\bar{X}$=Nelson-Denny %-tile
$\bar{Y}$=GPA

MODE OF DISCOURSE EFFECTS ON WRITTEN SYNTACTIC COMPLEXITY

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Kellogg Hunt's T-unit hypothesis has been used as the basis of much of the research on the syntactic elements of writing development. Hunt's (1965, 1970, 1977) assertion that mean words per T-unit (W/TU) tends to increase with age and skill of the writer has been supported by other researchers (Blount, Johnson, & Frederick, 1968; Braun & Klassen, 1973; Loban, 1976; O'Donnell, Griffin, & Norris, 1967; Stewart, 1978, Veal, 1974), and Hunt's indexes of syntactic maturity have been used as "norms" in numerous methodological studies of sentence combining (Maimon & Nodine, 1978; Mellon, 1969; O'Hare, 1973; Stotsky, 1975).

Hunt (1965) used written products from students' regular class assignments; so many types of writing were represented in his studies. He did not identify the purposes or types of writing represented except in general terms. Recent attention to the importance of purpose in writing has led some researchers to examine the effect of factors such as mode of discourse or purpose on syntactic complexity in writing. San Jose (1973) and Perron (1977) examined the effect of mode of discourse on the syntactic complexity of the writing of elementary school students. Results of both studies indicated that mean W-TU length was greatest in argument, followed by exposition, narration, and description. Rosen (1969) found that high school students produced longer T-units in referential writing than in expressive writing, and Crowhurst and Piche (1979) found that T-unit length was significantly greater in argument than in narration at both grades 6 and 10.

Crowhurst (1980) examined teachers' quality ratings of papers in various modes and found that ratings were highest for syntactically more complex papers in the mode of argument but not in the mode of narration. She proposed that when individuals write persuasive discourse, they are engaging in an activity which inherently requires the logical interrelationship of propositions. This results in T-units which are lengthened by the subordination of clauses and other elements. She concluded that argument or persuasion places greater demands on writers to make use of their syntactic resources than does narration, and that there is a positive relationship between effective argumentative discourse and the ability to relate propositions syntactically.

The present study was designed to examine the effect of mode of discourse and age and ability of student writers on syntactic complexity. The two modes of discourse chosen for this study were persuasion and description. These modes were selected because, in the studies of San Jose (1972) and Perron (1977), persuasion was found to be the most syntactically complex and description was the least syntactically complex. Therefore, it was proposed that maximum difference between the two modes would be exhibited.

Two other aspects of development in writing were considered in this study, composition length and rate of syntactic error. A positive relationship between composition length and development in writing has frequently been noted (Diederich, French, & Carlton, 1961; Gebhardt, 1978; Stewart & Grobe, 1979). In this study, words in each composition were counted and length of composition was considered a variable in measuring growth in writing.

Two types of sentence errors were chosen for analysis in this study. These two errors, sentence fragments and run-on sentences, were chosen for analysis in this study because they are common errors in students' writing (Kagan, 1980; Shaughnessy, 1977) and because they probably reflect students' efforts to consolidate T-units.

Research Questions

This study addressed the following research questions.

1. What is the effect of mode of discourse on syntactic complexity, length of composition, and incidence of sentence-production errors?
2. Are there grade level differences in syntactic complexity, length of composition, and incidence of sentence-production errors?
3. Are there ability-group differences in syntactic complexity, length of composition, and incidence of sentence-production errors?
4. Is growth in syntactic complexity associated with changes in rates of sentence-production errors, grade level, mode of discourse, and syntactic complexity?

Method

A total of 295 students in four 7th-grade classes (95 students), four 9th-grade classes (104 students), and four 11th-grade classes (96 students) each wrote two compositions, one in the descriptive mode and one in the persuasive mode. The total number of writing samples analyzed for this study was 590. Two of the classes at each grade level were identified as the high-ability group, and two were identified as the low-ability group. These designations were made based on the national norm percentiles of the reading and language subtests of the *Iowa Test of Basic Skills* and the *Test of Achievement and Proficiency*.

The writing assignment items used in this study were selected from those developed for the 1973-1974 National Assessment of Educational Progress (NAEP). Students in all three grade levels wrote on the descriptive item. Students in grades 7 and 9 wrote on a persuasive item in which they were asked to write to the school principal about a change they would like to make in their school, and the 11th graders wrote to apply for a job.

The data for this study were collected during a 2-month period in the first semester of the school year, 1980-1981. Each group of students wrote in response to the descriptive item, and within 1 week, wrote in response to the persuasive item.

Analysis of the Data

To determine composition length, words were counted for each composition. Compositions were segmented into T-units using criteria developed by Mellon (1969) and mean W-TU was determined for each paper. Run-on sentences and sentence fragments were identified in each paper. The number of errors in each paper was divided by the number of T-units in each paper to arrive at a ratio of run-on sentences per T-unit (R/TU) and sentence fragments per T-units (F/TU).

Means and standard deviations were determined for each grade level, each ability level, and each mode of discourse for the four dependent variables, composition length (W), words per T-unit (W/TU), run-on sentences per T-unit (R/TU), and fragments per T-unit (F/TU). A 2 × 2 × 3 analysis of variance was done. When a significant F-ratio was obtained, Tukey's

Length of Composition

The analysis of variance yielded a significant main effect for mode of discourse, $F(1,578) = 159.05$, $p < .0001$, grade level $F(1,578) = 89.48$, $p < .0001$, and developmental level $F(1,578) = 47.00$, $p < .0001$. Tukey's test for multiple comparisons indicated that there were significant differences between the means of the two modes, the two developmental levels, and the three grade levels, $p < .05$. Longer compositions were written in the descriptive mode and in the high developmental group $p < .05$.

There were significant differences $p < .05$ between each combination of grade level groups, 7 and 9, 9 and 11, 11 and 7 $p < .05$. The longest compositions were written by the 11th-grade students; the next in length were written by the 9th-grade students; and the shortest papers were written by the 7th-grade students.

Syntactic Maturity

The analysis of the variance for words per T-unit yielded a significant main effect for mode of discourse, $F\ (1{,}578) = 19.11$, $p < .0001$. Tukey's test indicated that there were significantly more words per T-unit in the persuasive mode than in the descriptive mode, $p < .05$. The interaction was significant for mode of discourse and grade level $F\ (2{,}578) = 16.63$, $p < .0001$. An analysis of simple effects revealed that there were significant differences among grade levels in the descriptive mode. This analysis yielded a significant main effect for grade level $F\ (2{,}292) = 47.64$, $p < .0001$.

Tukey's test indicated that there were significant differences between all three grade level combinations, 7 and 9, 9 and 11, and 11 and 7, $p < .05$. Papers in grade 11 contained more W/TU than the 9th-grade papers, and the 9th-grade papers contained more W/TU than the 7th-grade papers. Developmental tendencies like those found by Hunt (1965) and O'Donnel et al. (1967) were present in papers written in the descriptive mode. The analysis of simple effects revealed that there were no significant differences among the grade levels in the persuasive mode. All papers were high in W/TU in the persuasive mode: 7th grade—15.19; 9th grade—15.73; and 11th grade—12.28. The drop in the W/TU in the 11th-graders' papers could have been caused by the change in item. The item used in grades 7 and 9 was clearly persuasive, calling for students to persuade the principal of a needed chnge in the school. The 11th-grade item in which students wrote for a job elicited many a sentence in which students gave information about where they might be contacted and other information. This explanatory information was much less complex than the persuasive parts of the letters and may have accounted for the lower mean W/TU in the 11th-grade writing.

Run-on Sentences

The analysis of variance for run-on sentences per total T-units yielded a significant main effect for grade level $F\ (2{,}578) = 8.66$, $p < .01$ and developmental level $F\ (1{,}578) = 38.36$, $p < .0001$.

Tukey's multiple comparison tests indicated that there were significant differences $p < .05$ between the two modes of discourse, between the two ability levels, and between grades 7 and 11 and 9 and 11. There were no significant differences between grades 7 and 9. There were more errors in the descriptive mode, in the average developmental group and in grades 7 and 9.

Sentence Fragments

The analysis of variance for fragments per T-unit yielded a significant main effect for ability level $F\ (1{,}578) = 17.67$, $p < .0001$. The Tukey's multiple comparison tests indicated that there were significant differences between grades 9 and 11, $p < .05$. Compositions from grade 9 contained significantly more fragment errors than compositions from grade 11. Papers from the high ability level contained significantly fewer fragment errors than those from the average developmental group. There was no significant difference between the two modes.

Conclusions

Results of this study lend support to the following conclusions.

1. Other researchers (Diederich et al., 1961; Gebhardt, 1978; Stewart & Grove, 1979) noted a positive relationship between composition length and age and ability of the student writer. In this study, the length of the students' compositions increased at each grade level and in the higher ability groups.

2. Mode of discourse does have an effect on syntactic complexity. In this study, as in those by Rosen (1969), San Jose (1972), and Perron (1977), mode of discourse significantly affected syntactic maturity as measured by mean W/TU. This study supported the assertion of Crowhurst (1980) that persuasive writing inherently calls for the interrelationship of propositions and that this is expressed syntactically by the subordination of clauses and less-than-clausal elements. Mode affected length of composition also. Compositions in the descriptive mode were longer, but this may have been because the persuasive assignment was in the form of a letter.

3. Mode of discourse also had an effect on run-on sentence errors. There was a larger percent of run-on sentences in the descriptive mode. If persuasion does call for more subordination than description does, it follows that descriptive writing would rely more on the coordination of T-units than persuasive writing would. Coordination errors were the ones measures by this analysis of run-on sentence errors. An error analysis directed toward errors in subordination might find more errors in the persuasive mode.

4. Developmental differences among the grade levels were not present in the persuasive mode but they were in the descriptive mode. The findings of Hunt (1965, 1970, 1977), O'Donnell et al. (1967), and Mellon (1969) concerning development in mean W/TU were supported by data from the descriptive mode but not from the persuasive mode. All scores in persuasive writing were high. The 7th-grade scores were as high as the 9th- and 11th-grade scores. Perhaps when the rhetorical situation calls for it, the writing of younger writers can be as complex as that of older writers. The drop in 11th-grade persuasive mean W/TU score was probably affected by the assignment item. The 11th-grade item elicited a more explanatory type of writing than the clearly persuasive items used in the 7th and 9th grade.

5. The oldest students and students in the higher within-grade group made fewer sentence errors. Students demonstrated developmental tendencies in their mastery of the "print code." Differences were not great between grades 7 and 9. Both types of errors dropped off dramatically in the 11th-grade papers.

6. Developmental differences between high and average groups are present in error rates and length of composition. The students in the high group produced more words in their compositions and fewer errors. They also produced more W/TU in the descriptive mode.

Implications

The following implications were made from this study.

1. The purposes people have when they compose probably affect the most basic decisions they make when composing. In this study, purpose of mode affected even such a basic element as syntactic choice. Purpose probably affects other choices in writing. Much writing instruction and research has assumed that "good" writing is all the same. Recent theorists propose that the choices we make when we write are based upon what we hope to achieve in a particular piece of writing. Purpose in writing is not considered in Hunt's work and is often not considered when indexes of syntactic maturity are applied to writing samples. This study lends support to the idea that purpose must be considered as an important factor in writing research.

2. Good writing by adults is characterized by conciseness. Skilled writers work very hard to find the best way to say the most they can in the fewest words. Sometimes this demand for conciseness is conveyed to young writers. This study indicated that verbal skill by young writers is often demonstrated by volume of words. Perhaps this need to write many words reflects verbal development and should not be discouraged in

young writers.

3. Run-on sentence errors seem to occur when students repeat subjects or other sentence elements in order to sustain ideas across T-units. Developmental practice in ways to consolidate to create fewer, longer T-units may help students in that they do not have to sustain ideas across so many T-units. Thus, sentence combining may be a useful technique for helping students eliminate certain kinds of errors.

Since errors seemed to occur when students were involved in trying to subordinate and coordinate clauses, it might be profitable to link studies of students' errors to studies of sentence combining. The effects of practice in sentence combining may increase syntactic error over the short-term because students are trying new skills (Maimon & Nodine, 1978), but this study indicated that the errors may be related to a lack of skill in combining ideas. The error sentences were also characterized by many short T-units beginning with personal pronouns. Hunt (1965) proposed that the writing of young people may contain so many personal pronouns because of the necessity to maintain meaning across T-units. This stringing together of short T-units was characteristic of the run-on sentences in this study. It has often been difficult to measure progress in writing after instruction in sentence combining. Perhaps the study of students' errors should be measured after longer periods in which sentence combining was part of the instruction to see if mastery in ways to combine ideas means fewer errors in written composition.

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READING IN THE DISCIPLINES: A STRATEGIES APPROACH FOR DISABLED READERS

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The assessment of learners in difficulty demands that we examine what sets their learning apart. Is there something in their processing, something in the way they take in information and use it, that differentiates them from other learners? The question does not relate to inadequacy, but to differences in learning strategies and styles.

A problem-solving assessment process is used to examine characteristics which are difficult to identify in standardized testing. Clinically, we are not opposed to standardized testing; we need the information that traditional test structures generate; data are needed for instructional planning; and, systems operation requires pre-post documentation. Before we put children through traditional forms of testing, however, we want to establish the kind of relationship in which they can tolerate being taken to test ceilings, and pushed beyond them.

Some Ground Rules

Problem-solving imposes specific ground rules. FIRST, the focus is on process as well as response. There are many ways to solve a problem, each correct. Solutions may be totally unexpected but, by the same token, both defensible and profound. It's the process of thinking through a problem which is the critical mass, and it's that problem-solving strength that we seek to discover. Children arrive at many answers that diverge from, or extend the logic of, standard responses. If we can teach students to (consciously) use their own strengths, then the probability of getting appropriate (expected) answers is increased.

Second, models for learners-at-risk should start with strategies they use best, even though they may use them to solve problems that are not related to the subject matter at hand. The search, therefore, is for the students' successful thinking processes in areas that may have nothing to do with their academic life. After all, they have been [indirectly] telling us for years that standard methods don't work [for them].

"Strengths" has frequently been used by educators as a euphamism for "modality strength." [Do learners see better, hear better, touch better?] That's not our referent point. We're dealing with linked strategies making it possible for a teen-ager to get up in the morning and put his pants on correctly. What are the problem-solving devices that tell him where his clothes are, how he should get dressed, etc.?

THIRD, task solutions must operate on more than one level of logic. This is particularly true for youngsters who have experienced a great deal of failure, and are likely to give non-standard responses. Single-answer tasks lock that youngster into a learning cage from which there may be no escape. Presenting tasks which have many possibilities, where each answer reveals a different form of thinking, allowins for the structuring of situations (even at the diagnostic stage) in which there is much less likelihood of failure.

FOURTH, we have to set up task series which are hierarchical in nature, that is, each succeeding task should be more and more difficult. We want to be sure that the learner can be proud of finding appropriate solutions to tasks that are intrinsically worth-while. Neither the learner, nor the observers, should think, "Anybody can do that!"

One of the problems with traditional testing is that youngsters in trouble frequently can't even come close to their own grade level. You, and they, know that their test-ceiling is below that of their contemporaries. Therefore, in a problem-solving assessment we hve to select the kinds of tasks which allow us to take children to very high levels of thinking, where they have a sense (and everyone sitting around has a sense) that what they've done is important.

Our objective is to establish a series of procedures which make it possible for students to learn beyond their test ceilings. That is the centrality of the exchange. The way to create advocacy on the part of the observers is to work with materials and tasks that are relevant to school procedures and are of value to the students. The advocates must want to become partners in helping the child succeed at tasks which have long-range school, as well as short-range diagnostic, value.

FIFTH, parents and teachers, and even specialists, rarely have a chance to step back and watch the child at work. They're always the ones working with the youngster, and therefore they rarely have the perspective of the outsider looking at the learner's capabilities. What they do have, is the perspective of insiders with specific teaching objectives. Their commitment is to teaching, and if learning doesn't seem to take place, their frustration is as profound as the child's. In the case of the diagnostic process, their commitment is to observation, while somebody else teaches. The strategies used are replicable and, thus, can be tried (in the classroom and home) at some future date.

Frequently, teachers watching a specialist feel they don't have either the technique or the knowledge to carry out the same procedures. Specialists risk increasing the distance between themselves and those who have ongoing contact with the child—working teachers and parents. In a problem-solving exchange, strategies are selected that others can handle with ease, so there's more likelihood they'll actually be used.

Wouldn't it be wonderful if teacher training included courses like "Marketing" or "Motivational Research"? If we wanted to sell Corn Flakes, we would use models who liked Corn Flakes. Who needs an actor who'd tell us what's wrong with Corn Flakes every time they were mentioned? So, part of the issue of developing child advocacy (the SIXTH ground rule) is for the observers to agree on some positive elements about that child before the diagnostic exchange begins. Thus, we open a session with the question, "What's right about your child? Tell me what he or she does well." The answers help establish a mutually-agreed upon body of information related to specific acts.

It's not just a general, "I like children." It is, "I like THIS behavior in THIS child." For example, I like the way Mary starts her work (in school) right away," or, "I like the fact that John is always willing to help throw the garbage out (at home." Now we have a mutually agreed-upon, positive, valence. All too often, traditional diagnostic sessions (even the interview) focus on symptoms and negative learning characteristics. It is difficult to avoid negative test and performance expectations when stress, even though well intentioned, is the major initiator of the assessment process.

SEVENTH, there will be children who have difficulty no matter how carefully we structure the presentation of tasks. In a problem-solving process, where the guarantee is on success, we have to build contingency plans. What will we do if the youngster doesn't make it first crack out of the barrel? Obviously, we can't predict what we're going to find for every child. But we have to make educated guesses about the patterns displayed by learners in difficulty, so that we're prepared to step in when they experience frustration, or wander off course.

Problem-Solving Tasks

Students in difficulty often display extreme patterns. We all share learning strategies and characteristics, working along a continuum of learning. But, learners in trouble tend to polarize their behaviors—behaviors which are usually aphorized. People tend to call learners at one extreme "stubborn," and, at the other, "lazy" or "underachievers."

Beyond the appropriateness of student behavior, the question of learning characteristics is related to the production means by which we expect learners to output information. It has been the experience of most clinicians that children are often mis-identified or mis-labeled as a consequence of their responses to standardized questions, without much concern for the thinking processes that produced those answers. It is all too easy to decide that a youngster's problems lie in the realm of content, when answers seem bizarre or inappropriate.

In truth, however, many vulnerable learners function so uniquely that they defy standard categorization. They "see" dimensions to a problem that are hidden from examiners, teachers and parents; they utilize logic which may be foreign to the observing adults; they cannot cope with expected output systems, even when they are fully capable of understanding and processing the content of required subject areas.

One of the most revealing exercises in our problem-solving process involves an answer to the following task:

Instruction: Fill in the blanks in the problem.

Problem: P A T P E T P I T P — — — — —

Most adults, and just about every teacher who has ever looked at the problem answers in the following manner: P O T P U T. Indeed, failure to do so would usually be attributed to a child's difficulty with language or unfamiliarity with the vowels. Under actual test conditions, however, over half the students have responded with totally different, and totally correct responses.

The most common alternate is: P A T P E T P I T P M T P Q T. Almost every observing adult assumes that the answer is random and incorrect. Some problem solvers, however, notice that there are three intermediate letters between "A", "E", and "I". Mathematical logic, therefore, dictates a continuation of the pattern. Hence, "M" and "Q". If the problem is only to identify vowels the answer is inappropriate. If it's to fill in the blanks, the answer is not only appropriate, but indicates a preference for mathematical, over language-based, thinking.

And that's only scratching the surface.

What about the answer: P A T P E T P I T P I G P I N, or P A T P E T P I T P A N P E N?

Who says we have to use all the vowels?

Unfortunately, a standard language or reading test calling for the initial solution would give a negative score to the "legitimate" variations displayed above (and there are many more possibilities). It's not the content, but the expected referent, or output process which tends to confuse many unique learners.

If [illegible] we could remove the youngster's concern about HOW to do things, how to output them, they could concentrate on content. The issue is how clearly we structure the pattern by which we expect learers to respond. If we give them clear patterns, or if we allow for more than one appropriate answer, then there's room for problem-solving.

One of the greatest tragedies confronting unique learners is the lack of positive feedback for their strengths. They have usually accumulated a large supply of negatives for wrong answers and inappropriate behaviors. They work out of their weaknesses and can quote, chapter and verse, from long [internal] lists of failures. To complicate matters further, many of their strengths seem unrelated to school needs (i.e., sports, the arts, human relations, etc.). They are often grouped with similar students, although they may prefer independent work and long stretches of contemplation or isolation. They are given answers too soon, or presented with easier problems to solve, thus intensifying feelings of low self esteem and inadequate intellect.

In short, they are not trusted to carry out the serious [and joyful] business of learning. Most critically, they are not given credit for solid thinking, sometimes verging on the profound—usually, because their methods of attack and selections of strategy are so unique that they are overlooked by others.

The function of the problem-solving process is to identify their strengths and teach them to transfer those strengths to areas of learning and development that currently constitute their areas of failure. The demands on unique learners should not be reduced. Rather, our recognition of their capabilities must be increased.

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SHOULD TESTWISENESS CURRICULUM BE A PART OF UNDERGRADUTE TEACHER EDUCATION?

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The idea of teaching testwiseness to school-aged students and post-secondary students is certainly not innovative or earthshaking. Interest in this area has gained momentum over the last few years. In most situations the subjects of this interest have been the students. We are seeing more books and more chapters within reading and study skills books that have been written to teach students testwiseness strategies. Although some material has been directed toward the elementary child, more efforts have centered on the high school and college student.

What is Testwiseness?

The term "testwiseness" (TW) has meant many things to many people. A variety of interpretations and definitions has been associated with it. The following definition of testwiseness by Millman, Bishop, and Ebel (1965) will be used for purposes of this paper: "A subject's capacity to utilize the characteristics and formats of the test and/or the test taking situation to receive a high score." (p. 707)

This definition that TW is independent from the test-takers' knowledge of the content contained on the test itself. An immediate question that comes to mind would be whether or not one's mental or general ability has a relationship with TW. A review of the literature reveals that numerous studies have investigated this question.

Diamond and Evans (1972) studied the TW of selected sixth grade students and reported that no relationship exists between TW and general skill or ability. However, they did conclude that TW was unique to the cues or clues under study. This conclusion had also been previously substantiated by Dunn and Goldstein (1959) who found no relationship between TW and intelligence.

In a related study, Ayrer, Diamond, Fishman and Green (1976) did not find any relationship existing between TW and increased scores on the California Achievement Test among inner city students. For the most part, all correlations were low. Thus, this study does not support the Diamond and Evans research statement that "TW as a secondary cue response is quite specific to the particular clue or cue under investigation."

Testwiseness Strategies

When discussing TW, many references are made to the categorization of TW strategies as developed by Millman, Bishop and Ebel (1965). In their paper, two categories are presented: elements that are independent of the test constructor or test purpose and those that are dependent upon the constructor or purpose. The first category, often called general test-taking strategies, contains strategies for utilizing time efficiently, proofreading answers in order to avoid errors, learning how and when to make appropriate guesses, and using deductive reasoning in order to arrive at a correct answer. Included in the second category are strategies designed to consider the intent of the test constructor for using certain questions and for using cues found in the test when the answer is uncertain.

Gibb (1964) developed a strategy concerned with the problem of cues in test items and identified TW as a secondary cue response. His major premise was that students can be trained in TW and their performance would not be determined by knowledge of the subject matter.

The study by Diamond and Evans (1972) used fictitious material to eliminate content familiarity with naive sixth grade students, and investigated the correlations of TW. Diamond and Evans' strategy included the following five item faults selected for the study: association, specific determiners, correct alternatives, grammatical clues and overlapping distractors. With TW defined as a secondary cue response, the naive students appeared to have possessed it. However, data revealed that TW is not a general trait, but specific to the particular clue or cue being investigated. Therefore, the results were supportive of those of both Gibb (1964) and Dunn and Goldstein (1959).

Testwiseness Training

The practice of TW training has been widely investigated with the effects resulting in varying degrees of success. Giving emphasis on characterisics and format of the test rather than upon content or coaching for a specific exam, Wahlstrom Boersma (1968) concluded that ninth grade students receiving TW training had higher scores on criterion referenced tests. Oakland (1972) showed that disadvantaged preschool students having had TW training obtained a higher mean on the Metropolitan Reading Readiness Test than those in the control group. However, when measured four months later, the results were not significantly different.

Callenbach's (1971) investigation reported that test-naive second graders who received TW training scored significantly higher on both an immediate and delayed standardized reading posttest than those students who received no training.

Not all researchers, however, found TW training to have positive effects. As cited earlier, Diamond et al. (1976) found no substantial relationship between the scores on the Vocabulary, Reading Comprehension or Language Usage subparts of the California Achievement Test of students given TW training and the control group. Yearby (1975) found that the TW skills of some third grade students were significantly increased by training but that this did not transfer to a significant degree on a standardized reading test. In addition, although Jongsma and Warshauer (1975) report that fifth grade inner city students who had studied a unit on TW skills averaged higher reading achievement scores than a control group, their gains were not significant.

Although research on TW has varied to a great extent in the aspects of measuring TW and the strategies used, some conclusions can nevertheless be drawn. First, TW is a bona fide entity and deserves attention. Second, TW is measurable. Third, TW appears to be made up of a set of specific skills rather than a collection of some general or wholistic abilities, and, fourth, TW training can be administered to students of all ages from early childhood to adulthood.

It would, therefore, seem that teachers at all levels need to be made aware of TW strategies and be able to train their students in acquiring these skills. This awareness could take place in teacher education programs, where preservice teachers could be trained to teach TW skills to their future students.

Pilot Study

Since we believe that some emphasis on the teacher as the subject of TW interest is called for, we developed this pilot study to begin looking at that area of teacher training. Because the need for the training of secondary education majors in TW is perhaps more obvious, we decided to do this pilot with elementary education majors. We feel that this pilot study might help give us *some* sense of the effectiveness of this training for preservice elementary teachers who will teach in a variety of grade and ability levels and in a variety of content areas.

The purpose of this investigation was to explore the research question: Will some training of undergraduate student teachers to teach TW strategies result in a signiicant degree of difference between the criterion referenced content area test scores of elementary children taught these TW strategies and the test scores of elementary children not taught these TW strategies?

Procedures

Just prior to their student teaching, and while completing a testing and measurement class, eleven elementary undergraduate majors received a module (Flippo) containing information and learning activities in TW strategies for objective tests appropriate for use with early childhod through college-level students, and a seminar class conducted by one of the researchers. This class covered an orientation to the use of the module and an explanation of the procedures to be used with the module, activities for teaching TW strategies to children, and information regarding the pilot study. Of the eleven student teachers received the TW training, eight of them have been included in this pilot.

Student teachers were assigned to second through sixth grade ability grouped classrooms in one of four elementary schools in northwest Mississippi. Students in these schools had been previously ability grouped by their reading scores on the California Achievement Test. In most cases, student teachers were assigned to classrooms with all high ability grouped children in a given grade in the same room or all average ability grouped children in a given grade in the same room. One student teacher had a more heterogeneous classroom assignment; however, there were not enough low ability children in that room to use low ability groups in this pilot study.

Students in the high ability and/or average ability groups in each class were randomly assigned at each of these ability levels into control and experimental groups. A total of 174 randomly assigned students in grades two through six were included in this study. Seventy-one of them were in experimental groups and one hundred and three of them were in control groups. The student teachers taught a unit in one of the social studies disciplines to the entire class of children over a period of about one month. Additionally, experimental groups were given TW instruction by their student teachers. The students in the control groups did not receive TW strategies training but instead were involved in regularly planned instructional activities within the units being studied.

Each day for a little over three weeks the student teachers worked through the 16 activities in their modules with the experimental groups of children. While the experimental groups worked on the TW activities with the student teachers in the classrooms, the children in the control groups worked on other activities like art, library work, etc., related to their social studies unit with the regular classroom teachers outside the classrooms. During this same time period, student teachers conducted whole class instruction in social studies units. The student teachers were cautioned not to include any TW information when teaching the social studies units. Likewise they were cautioned not to include any material from the social studies units in the TW activities with the experimental groups.

Each student teacher developed a criterion referenced test covering the social studies unit s/he taught for the purpose of measuring students' knowledge of the content taught in that unit. This test was developed according to the guidelines and instructions that the student teacher received in her/his testing and measurement class. It also included some not so obvious TW cues. All tests were submitted to the Division of Curriculum and Instruction at Delta State University and the researchers for evaluation of validity.

At the completion of the social studies units and treatment activities, each entire class in this study was given the social studies unit test developed by their student teacher. Only data from the tests which met a minimum quality of measurement were included in this study.

Statistical Analysis

An initial concern was the possible existence of significant disparity in TW between the experimental and control groups in each classroom prior to administration of the treatment. To check for pre-treatment variance, the classroom teachers of these groups were asked to rate the level of TW of each child in their class on a thirty point scale. A "Testwiseness Rating Scale" was developed specially for the study. Group ratings were then compared using a Mann-Whitney Test (Ryan, Joiner, & Ryan, 1976).

Of nine group comparisons made from the eight classrooms included in this study, none were significant at the .05 alpha level. Table 1 indicates median scores for the different groups and the subsequent p levels derived from administration of the Mann-Whitney Test. The findings indicated no signifiant difference in TW between experimental and control groups for any class prior to treatment.

To determine effectiveness of the treatment, the unit posttest scores for each instructional group were compared. The Mann-Whitney Test was used. Table 2 indicates median scores for the different groups and the subsequent p levels. The findings indicate that the TW instruction was not a significant influence on unit posttest peformance.

Conclusions and Recommendations

Although there was not a significant difference between the experimental and control treatment groups for any of the units and for any of the grades and ability groups included in this pilot study, there was a slightly higher observed score for six of the nine experimental groups. This observed, but insignificant, difference certainly does not indicate that the student teachers were able to transfer the TW strategies instruction they received to the students they taught. However, it does indicate that a more tightly controlled study should be done to further explore the possibilties of TW training for student teachers and its transfer to their future students.

Many factors should be considered, such as the student teachers' mastery of the TW instruction they receive, the effects of several different approaches to the TW training of student teachers, the amount of TW training given to student teachers, and the effects of providing TW training to student teachers at different times or stages in their undegraduate education preparation.

While this pilot study did give us *some* sense of the effectiveness of TW training for preservice elementary teachers, it suffered because of the number of concomitant variables that were not controlled for. For instance, to what extent did the outside-the-classroom enrichment activities (i.e., art, library work, etc.) in the social studies units provide the control groups with more knowldge of or interest in the units, as compared to the benefits for the experimental groups receiving TW training? Or, to what extent did the newness or novelty of the student teachers teaching the TW effect the experimental groups' attentiveness? Did all of the student teachers give equal attention to the TW instruction of their experimental groups? These are but a few of the variables that should be controlled before another similar study is attempted. We think some TW training for preservice education students is a good idea; however, more positive documentation will be necessary before it can be thoroughly recommended.

Table 1
Pre-Treatment Ratings on Testwiseness

	Median		p level
Group Comparison	**Experimental**	**Control**	
Second Grade-High Ability Transportation Unit	26.00	28.00	.0814 (NS)
Second Grade-Average Ability Transportation Unit	24.50	23.00	.6985 (NS)
Third Grade-High Ability Mississippi Unit	21.50	21.00	.8918 (NS)
Third Grade-High Ability Differences Are OK Unit	23.00	25.00	.2934 (NS)
Third Grade-High Abiity US Postal Service Unit	21.00	21.00	.6261 (NS)
Fourth Grade-High Ability Regions of the US Unit	22.00	21.00	.2727 (NS)
Fourth Grade-Average Ability Japan Unit	27.00	27.00	.9611 (NS)
Fifth Grade-High Ability Tooth Care Unit	23.50	21.00	.5669 (NS)
Sixth Grade-High Ability Mexico Unit	21.50	24.00	.0793 (NS)

Table 2
Comparison of Unit Posttest Scores by Group

	Median		
Group Comparison	**Experimental**	**Control**	**p level**
Second Grade-High Ability Transportation Unit	100.00	100.00	1.000 (NS)
Second Grade-Average Ability Transportation Unit	97.50	92.50	.6985 (NS)
Third Grade-High Ability Mississippi Unit	94.00	82.00	.4025 (NS)
Third Grade-High Ability Differences Are OK Unit	82.00	79.00	.8182 (NS)
Third Grade-High Ability US Postal Service Unit	94.00	93.00	.8983 (NS)
Fourth Grade-High Ability Regions of the US Unit	99.00	98.50	.8625 (NS)
Fourth Grade-Average Ability Japan Unit	100.00	100.00	1.000 (NS)
Fifth Grade-High Ability Tooth Care Unit	89.00	85.00	.1921 (NS)
Sixth Grade-High Ability Mexico Unit	85.50	88.50	.5934 (NS)

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INVITED ADDRESS

READING IN THE DISCIPLINES: COMPREHENDING PROPOSITIONS

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General reading consists of the information and skills that are useful in the reading of everyday language, e.g., the language of comic books, newspapers, magazines, and romantic novels. Special reading embodies the information and skills that are useful in the reading of the language of the special fields of study. It is sometimes held that reading teachers, who teach general reading and often take it to be the only kind, are the only ones qualified to teach reading and that subject teachers, therefore, who also frequently regard general reading as the only kind, do not have a responsibility to teach the special reading relevant to their respective fields. My aim is to dispel this contention. I propose to do so by providing an overview of the place of reading in the theoretical disciplines and then by taking a look at the connection between teaching reading in a theoretical discipline and teaching the discipline's content.

A familiar scheme for analyzing the theoretical disciplines is Aristotle's. According to it any intellectual discipline—theoretical, productive, or practical—may be regarded as having four elements: an end (that which is attained within the discipline), a subject-matter (that which is investigated), a method (the way whereby the end is to be attained), and basic principles (the concepts and statements by which all other concepts and statements of the discipline are explainable). Different theoretical disciplines might have different sorts of subject-matters, methods, and basic principles; but all of them have ends of the same type, namely, knowledge. Thus, the subject-matter of mathematics is abstract, invariable, and universal, whereas that of ethics, though universal, is neither abstract nor invariable. The method and basic principles of mathematics may be described as deduction and as form and abstraction, whereas those of ethics may be described as inquiry and as excellence and the soul. However, the end of mathematics and that of ethics, albeit specifically different from each other, are both knowledge.

The elements of a theoretical discipline may be regarded, to some extent, from the standpoint of language. The end of such a discipline, which is typically a body of conclusions, consists of universal or, at least, highly general statements that are expressed. In some cases, for example, logic and physics, the media for setting forth the final statements of theoretical disciplines are often "artificial"; in other case, for example, history and aesthetics, the media are frequently "natural." Artificial or natural, however, they are linguistic; for they are, *inter alia*, subject to the rules of logic, meaning, and grammar. The subject-matter of a theoretical discipline, which may be concepts, events, things, or something else, always may be designated and discussed through a language. The method is constituted by directives, and these always may be presented by virtue of language. The concepts and statements making up the basic principles always are expressible linguistically.

The linguistic media whereby the elements of a field, theoretical or not, appear are tantamount to the language of the discipline. These media include (among other things) signs, formulas, and arguments. The signs (e.g., the terms of a language) are mainly for expressing the concepts and denoting the objects relevant to the field. The formulas, which consist of ordered signs, are primarily for presenting the statements pertinent to the field. And the arguments, consisting of ordered formulas, are largely for setting forth and defending claims within the language. Some of the signs, formulas, and arguments of a linguistic field may be original to the field. The original signs of an area are those whose meanings are determined, partially if not completely, by the area. The original formulas are those whose meanings come, to some extent, from the area. And the original arguments are those whose respective standards of acceptability lie, to a degree, within the area. Thus, the term "tort" is original to the language of law; the formula, "2+2=4," is original to the language of mathematics; and the ontological argument for the existence of God is original to philosophy. While a set of signs, formulas, and arguments might be original to a language, it might pertain to another language also. Indeed, it seems that some of the signs, formulas, and arguments of a linguistic field usually derive from another field. Philosophy is notorious for utilizing elements from everyday discourse and the languages of many other disciplines, including productive and practical, as well as theoretical, ones. The sciences long have borrowed from mathematics and from each other. And the language of everyday life is stocked occasionally with items from the languages of the sciences.

The languages of the theoretical disciplines have a distinctive difference from those of the productive and practical disciplines. The subject-matters, methods, and basic principles of the productive and practical disciplines, like those of the theoretical disciplines, may be designated and discussed through language, but their ends, unlike those of the theoretical disciplines, might not be identifiable with linguistic elements. The end of a productive discipline, which is a product (fine or utilitarian), might, as in the case of a poem, consist of matters that are linguistic, but it need not, as in the case of a pair of shoes. Similarly, the end of a practical discipline, which is action, might be matters of language, as when it is speech acts, but it need not be, as when it is an activity for exercising the body. Perhaps it is because of their close tie to language that the theoretical disciplines often are spoken of as embodied in language, and maybe it is because of this tie they usually are identified by behaviorists with verbal behavior.

In any event, the linguistic aspect of the theoretical disciplines is clearly where reading has its place in them. A major way to learn the contents of the theoretical disciplines is to read about the disciplines, which means, more specifically, to read about their subject-matters, their ends, their methods, and their basic principles. This approach is appropriate whether students are to become merely acquainted with the theoretical disciplines or whether they are to become experts in them. Besides being an instrument whereby the theoretical disciplines may be learned, reading occupies another instrumental role in such disciplines. It is a major vehicle by which the practitioners of the theoretical disciplines carry on their work. It is the vehicle whereby current practitioners learn what their predecessors accomplished, and it is the vehicle by which current practitioners most often learn what each other is doing. Of these two roles, the former should be especially interesting to the subject teacher. If students are to learn the contents of the theoretical disciplines, they practically must be able to read the various languages of those disciplines; and if they are to be able to read these languages, they must learn them on their own or through the assistance of teachers versed in them, who are not reading teachers but teachers of the theoretical disciplines.

Because the language of a theoretical discipline is special to that discipline, the reading pertinent to learning the discipline's content is special, not general. It might be, of course, that some general reading will be helpful in reading about a theoretical discipline; for the language of the discipline might contain elements from everyday language. Nevertheless, the ordinary linguistic elements that might appear in a theoretical discipline's language will not make complete sense as components of that language until they are linked to the language's other components. Thus, while the language of history contains much that is derivative from common language, it is not just one part everyday language and one part technical language; rather, it is an intermixture of the common and the technical. If a theoretical discipline's language were merely one part everyday and one part technical, a teacher of the discipline might protest rightly that he is not responsible for teaching the general reading integral to his field. But because the language of any theoretical discipline is special even if it contains ordinary linguistic elements, not even the teacher of a subject whose language embodies common linguistic components can shift the total responsibility for teaching the general reading related to his field to the reading teacher. The latter does not have the information or the skills to relate any ordinary linguistic elements that might be involved in a theoretical discipline's language to the special context of that language.

According to the foregoing it follows that the teaching of reading the language of a theoretical discipline is distinguishable from teaching the discipline's content. It might be that a person can teach the content by relying solely upon speech or some other medium other than print. It might be that a teacher has students who are bright and motivated enough to learn on their own to read the discipline's language and, therefore, might not need to be taught to read the language while they are being taught the content. Because teaching the reading of a theoretical discipline's language is distinguishable from teaching the discipline's content, it might prompt someone to believe that students of the subject must be taught its language separately from their being taught its content. It would be a mistake to believe this, however. Not only can the language of a theoretical discipline be taught along with the content, but it has to be. We will attempt to justify this position by focusing upon the teaching of the cognitive content of the theoretical disciplines.

As already explained, the end of a theoretical discipline is knowledge, which means that to teach the discipline's content is, among other things, to teach the knowledge which has been attained in the discipline. In its standard sense knowledge is justified true belief, i.e., true belief grounded upon adequate evidence. The object of a true belief is a proposition, or a proposed state of affairs that is either true or false. If the proposition that one believes is false, then one's belief is false; if it is true, then one's belief is true. Knowledge, then, is justified belief in a true proposition; and to teach the knowledge attained in a theoretical discipline is to teach the propositions which have come to be known in the discipline. Teaching a proposition requires that the teacher communicates the proposition, and communicating it requires that the teacher presents an expression of it (his own or someone else's). A characteristic of teaching is that it is a communicative act, which implies that it embodies some language. And a characteristic of propositions in a theoretical discipline is that they are expressible. The medium through which a proposition is expressible is language, and the language through which the propositions known in a theoretical discipline are expressible is the language of that discipline. Accordingly, to teach the propositions known in a theoretical discipline is to communicate them through the discipline's language. It is obvious, then, that a person may teach the reading of the language of a theoretical discipline while teaching the propositions known in the discipline; for in teaching the propositions he also may teach the elements of the discipline's language by which the propositions are expressed.

With little reflection it should be further evident that a person can teach these linguistic elements *only* in conjunction with teaching the relevant propositions and other factors of the discipline. The linguistic structures for expressing propositions are formulas, of which sentences and equations are familiar examples. While reading formulas in some contexts might amount to nothing more than recognizing the symbols and the relations ordering them in the formulas, reading the formulas expressing the propositions known in a theoretical discipline involves two other matters. 1) The function of the formulas as formulas in the discipline's language is to express certain propositions. Hence, reading the formulas includes recognizing that they do express propositions and comprehending the propositions expressed. 2) The propositions expressed by the formulas are grounded on evidence. Consequently, the formulas, when read, must be connected with the formulas stating the evidence such that the latter formulas can be seen as stating evidence for the propositions. In other words, the formulas expressing the propositions must be read in the way that the formulas stating the conclusions of arguments are to be read.

While our contention that teaching the reading of an intellectual discipline's language must be in conjunction with teaching the discipline's contents is directed at teaching the propositions known in the discipline, it may be seen as applicable to teaching the other contents of the discipline, namely, its subject-matter, method, and basic principles. The subject-matter of an intellectual discipline is what the discipline's knowledge is about, and statements about the subject-matter are to be made in the discipline's language. The method of the discipline is the way whereby the discipline's end is to be attained, and statements about the method are to be made in the discipline's language. The basic principles of the discipline are the concepts and statements whereby all other concepts and statements of the discipline have to be understood, and statements about them are to be made in the discipline's language. Accordingly, the language of an intellectual discipline serves not only to communicate propositions known in the discipline but also to express statements about the discipline's subject-matter, method, and basic principles. If, therefore, a person is to teach the reading of the elements of an intellectual discipline's language whereby statements about the discipline's subject-matter, method, and basic principles are made, he or she has to present the elements to the student so that they are seen as having the function which they do have and are understood further as expressing the statements which they are employed to make. Thus, teaching the reading of these linguistic components must go hand in glove with teaching the discipline's content.

In sum, we have tried to show that subject teachers have a responsibility to teach the special reading of their respective fields. In providing an overview of the place of reading in the intellectual disciplines, we maintained that reading the languages of such disciplines is a major vehicle for learning the disciplines. The point of this contention was that the students in the theoretical disciplines greatly need to be able to read the special languages of such disciplines. In examining the connection between teaching the reading of an intellectual discipline's language and teaching the content of the discipline, we insisted that teaching the reading must go along with teaching the content. The point here was that, because the subject teacher (not the reading teacher) is the one versed in the language along with its content. We are tempted to continue and expand our argument to include the productive and practical disciplines, but one should not always attempt to do what one is tempted to do.